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INTERNATIONAL EDITION
THE MINES HANDBOOK
SUCCEEDING
THE COPPER HANDBOOK
Founded by Horace J. Stevens, 1900
DESCRIBING
THE MINING COMPANIES OF THE WORLD

BY
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Member of Mining and Metallurgical Society of America;
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Mines of the World; Geology of Butte,
Montana; Classification of Ore
Deposits, etc.

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by Walter Harvey Weed

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*See
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balance in property. Outstanding debts, Feb., 1917, \$118,389. No financial information received since.

Property: the Greenhorn group, 19 claims, 6 patented, together with one millsite, total 65 acres; also 120 acres held by location, making 185 acres mineral land in the Hardscrabble district, Custer county.

Development: by tunnel showing a vein of zinciferous copper and lead ore with small gold and silver values. Has water power, compressor and 100-ton concentrating mill. Erected a 100-ton flotation plant to treat tailings in 1915.

Idle several years.

MARLIN MNG., MLG. & POWER CO.

COLORADO

Address: J. W. Thomas, supt., Montezuma, Colo.

Property: the Marlin gold-silver mine at Montezuma, Summit county. Operated during part of 1919, and work reported resumed late in 1921.

MARMATITE MINING & LEASING CO.

COLORADO

Address: H. M. Fields, pres., Rico, Colo. E. H. Snyder, mgr.

Property: a lease on the Blackhawk mine, owned by the Rico-Argentine Co., also on the Pro Patria mine of the Syndicate M. & M. Co., and the Silver Swan mine. The Enterprise vein of the Silver Swan is being opened. Ore contains gold, lead, zinc, and silver. Reported shipping at rate of two cars per day in 1919, to the Durango smelter. Operations were curtailed during 1920 on account of the apex suit started by the Rico Cons. M. Co. This was settled in Jan., 1921, Marmatite paying \$7,346 and Rico Argentine, \$29,946, representing net value of 5,000 tons of ore extracted from Rico Cons. ground.

Company controls the Marmatite M. Co., which operates the Emma gold-silver mine at Dunton.

MARSHALL & RUSSELL GOLD M. M. & T. CO.

COLORADO

Out of Business. See Vol. XII.

MARTIN MINING AND POWER CO.

COLORADO

Fully described in Volume XIV. Holdings acquired, October, 1920, by Treasure Mountain Mines, Inc., which see.

MARYANA MINING & LEASING CO.

COLORADO

Mail returned unclaimed, July, 1919, from former address, Cripple Creek, Colo. Probably dead.

Inc. in 1914. Company had a lease on the Mary McKinney mine from the 8th level down.

MARY FLORENCE MNG., MLG. & LEASING CO.

COLORADO

Address: 758 Corona St., Denver, Colo.

Property: gold-silver claims at Parshall, Grand county. Operated during 1919, but made no shipments.

MARYLAND MINES & RED. CO.

COLORADO

Address: 1143 Larimer St., Denver, Colo. Mine address: Rollinsville, Colo.

Officers: W. N. MacPhail, pres.; J. Miller, v. p.; H. F. Christensen, sec.-treas.

Property: Maryland group of 22 acres in South Boulder district, Gilpin county. Ore reported to average \$12 per ton in gold and copper.

MARY MCKINNEY MINING CO.

COLORADO

Address: Colorado Springs, or Box 1346, Cripple Creek, Colo.

Officers: Chas. Castello pres., gen. mgr.; Daniel Thatcher, v. p.; John L. Nichols, sec.-treas.; with J. H. Nichols, and W. H. Spurgeon, directors.

Inc. March 30, 1892, in Colorado; renewed March, 1912. Cap. \$1,500,000; shares \$1 par; outstanding June, 1918, \$1,409,252. Transfer office: Colorado Title & Trust Co., Colorado Springs. Annual meeting, 2nd Monday in February. Listed on Colorado Springs Exchange.

RESERVE MINING CO.**COLORADO**

Office: 840 Gas & Electric Bldg., Denver, Col.

Property: the Hoil gold-silver mine at Alma, Park county. Operated part of 1919; idle in 1920-21.

RESOLUTE MINING CO.**COLORADO**

Address: J. A. Houghton, pres., 54 De Menil Bldg., St. Louis, Mo.

Mine address: Rico, Dolores county, Colo.

Property: Telegraph, Newman and Expectation groups, near Rico. Idle several years.

REVA GOLD MINING CO.**COLORADO**

Address: 935 Foster Bldg., Denver; or G. R. Calhoun, supt., Cripple Creek, Colo.

Property: operating under lease, the Rose Nicol mine of Rose Nicol Gold Mining Co., Battle mountain, Cripple Creek, Teller county.

Development: by 1,200' shaft and several thousand feet of workings. Ore has been opened on No. 6 and 7 levels, at 800' and 1,000' below the surface, respectively, and on Roosevelt tunnel-level about 2,100' below the collar of shaft. In 1920, ore opened on No. 10 level yielded \$25 to \$71 per ton.

Equipment: includes aerial tram extending from mine to Midland Ry. terminal. Ore is treated at the Golden Cycle mill at Colorado Springs.

REVENUE TUNNEL MINES CO.**COLORADO**

Address: Carl J. Sigfrid, Ouray, Ouray county, Colo.

Property: controlled by the Reynolds Estate of Denver. Includes the Cumberland, Revenue-Virginus, and Wheel of Fortune mines. Extensive development work was done in 1918, and the Cumberland mine shipped silver-lead ore. The Revenue-Virginus is credited with a total production of \$26,000,000. The Wheel of Fortune mine, located in 1875, has been worked for varying periods and is to be operated with the Revenue.

REVILS MINING & INVESTMENT CO.**COLORADO**

Idle since 1918.

Address: Silver Cliff, Custer county, Colo.

Property: the Hornsilver Consolidated mine just E. of Silver Cliff in the Hardscrabble district, operated under bond and lease. Ore carries silver and manganese.

REX GOLD MINING & MILLING CO.**COLORADO**

Properties are leased to Lincoln Mines & Reduction Co., which see.

Address: Cripple Creek, Teller county, Colo.

REY SILVER MINES CO.**COLORADO**

Idle in 1920-21. Address: Fairplay, Park Co., Colo. Mine at Alma, Sacramento district, reported to have opened a 12 to 15' silver vein, assaying \$50 per ton in 1919. The ore is believed to be on the London contact, which underlies several properties in that section. There were 31 sets of lessees working on the London.

RICHMOND HILL MINING, MILLING & LEASING CO.**COLO.**

Address: Aspen, Pitkin county, Colo.

Officers: W. H. Cornwall, pres.; C. E. Doolittle, v. p.; F. M. Yates, sec.-treas., with Jos. Mellor and A. Johnson, directors.

Property: company has a lease and option on the Little Annie silver-lead mine and mill at Aspen. Dump was said to contain 5,000 tons of payable ore, besides 4,000 tons of ore broken in the mine. Operated part of 1919 and shipped products to smelter. The mill was enlarged to 80 tons per day during 1920.

RICO ARGENTINE MINING CO.**COLORADO**

Office: Mackintosh Block, Salt Lake City, Utah. Mine address: J. M. Stempel, supt., Rico, Dolores Co., Colo.

Officers: F. W. Price, pres.; A. E. Rykert, v. p.; J. H. Woodmansee, sec.-treas., with S. A. King, J. E. McKnight, N. S. Nielson and L. E. Frick, directors.

Inc. 1912, in Utah. Cap. \$100,000; 10¢ par; 903,136 issued; assessable; assessment No. 10 of 1¢ per share levied March 26, 1921. Company is its

own transfer agent and registrar. Listed on Salt Lake Exchange.

Property: the Blackhawk and Argentine groups, 21 claims, 145 acres, mostly patented, adjoining the Rico-Wellington Mining Co. property.

Geology: alternating strata of limestone and sandstone, dipping at angle of about 30° and cut by almost vertical fissures of great extent and persistence. Where these fissures cross the soluble limestone they contain flat replacement deposits of sulphide ores, carrying copper, zinc, and lead, with gold and silver values. The ore shoots or bedded deposits are from 3-30' thick. These fissures and the limestone are identical both in character and occurrence with those which are producing in the Rico-Wellington property. In the apex suit with the Rico Consolidated, the Rico Argentine held that the Blackhawk fissure was the source of the enrichment of the beds that had been followed into the disputed ground, in other words, it was the master vein. Judge Searcy decided January, 1921, that the ore-beds were formed by E-W. fissures rather than by the Blackhawk. This reverses the generally accepted local theory.

Development: by a new tunnel, 200' lower than former workings, that drained the main shoot through to a connection with upper workings. In 1918, it was reported that bismuth was appearing in some of the ore. A tunnel was driven 700' in the ground in dispute with the Rico Cons. and opened silver-lead-copper shipping ore.

Production: for 1917, \$100,000; the net smelter returns of which were \$88,837. Of this, \$47,576 was for ore shipped by company and \$41,261, shipped by lessees. On January 1, 1919, company operations were suspended until September, but lessees continued shipping at rate of 1,000 tons per month.

Late in 1918 the Rico Consolidated M. Co. brought suit against the Rico Argentine Co. and Marmatite Leasing Co. over apex rights for wrongful extraction of 15,000 tons of ore, worth \$900,000. In October, 1920, the plaintiff agreed to modify the amount, provided the ore had been mined in good faith. Judgment was rendered in Jan., 1921, against the Rico Argentine, which had to pay \$29,946, and the Marmatite, \$7,346. This represents 5,000 tons of \$740 ore, net value.

All operations suspended, pending final decision of appeal.

RICO CONSOLIDATED MINES CO.

COLORADO

Owned by Knight interests of Provo, Utah. Mine address: Rico, Dolores Co., Colo. Stock listed on Salt Lake City Exchange.

Property: adjoining the Rico Argentine on the N. E., is said to show a vein of copper-silver-lead ore 35' wide in the upper workings. For geology see the Rico Argentine.

Development: by tunnel over 300' long. Shipments have been made, but no figures are available.

Company brought suit in 1918 against the Marmatite Leasing and the Rico Argentine companies, alleging that they had trespassed on the Allegheny lode. Company claims that 15,000 tons of ore valued at \$60 per ton, amounting to \$900,000 had been shipped. This was modified in Oct., 1920, to \$37,000, provided that the ore had been extracted in good faith. In Jan., 1921, judgment was rendered in favor of the Rico Consolidated for \$37,000, the net value of 5,000 tons.

RICO MINING CO.

COLORADO

Reorganized as Syndicate Mining & Milling Co., which see.

RICO-WELLINGTON MINING CO.

COLORADO

Address: 11 Knight Block, Provo, Utah.

Officers: O. Raymond Knight, pres.; Chas. Read, v. p.; R. E. Allen, sec.-treas.; R. L. Anderberg, asst. sec.-treas.; H. R. Trenholm, gen. mgr. **Directors:** O. Raymond Knight, J. W. Knight, Chas. Read, K. S. Jordan, W. L. Mangum, R. E. Allen, H. R. Trenholm, Albert Lofquist, supt.

Inc. August, 1911, in Utah. Cap. \$1,000,000; \$1 par; assessable; 51% of stock owned by Knight Investment Co. Listed on Salt Lake Exchange.

Since the property was taken over by its present owners it has earned

over \$500,000, has invested \$50,000 in a mill and expended \$100,000 in development work. The debt of \$150,000 advanced for this equipment and work was paid off in 1916. Early in 1921, company owed the bank \$80,000, and an assessment of 10¢ a share was levied.

Dividends: on April 25, 1917, No. 1 of 1¼¢ per share was paid, and a total of 8¼¢ in that year; \$39,000 paid to date.

Property: the Wellington mine, at Rico, Dolores county, which contains ore-shoots formed by replacement and contact metamorphism in the limestone beds of the middle member of the Hermosa formation. In 1914 a flat deposit of zinc-lead ore was cut. It lies parallel to the Blackhawk fault. To the north the orebody is cut off by a cross fault parallel to the Nellie Bly fault, the orebody north of the fault being 170' below. Across the Blackhawk fault a copper deposit, replacing limestone and broken by several faults, has been opened, the ore carrying good values in copper and silver.

Development: by the Mountain Spring tunnel and about 22,000' of work, said to expose large amounts of lead-zinc and copper ore. Exploration is devoted to the Blackhawk and Iron veins, two great ore-bearing fissures, traversing the property N. W. and S. E. In these the ore makes in lime beds that look almost like coal deposits, and as many as 5 and 6 beds, one above the other, have been opened.

In 1921, ore as mined was 30' wide, 6' high and of unknown extent on its strike. Shipments averaged 18 oz. silver per ton, and 7% lead. The high grade ore mined in 1920 was faulted. The large body of pyrite ore is mined and sold as flux.

Equipment: includes a compressor and 2,500' tram to the Rio Grande railroad, handling 50 tons of ore per hour at a cost of 23¢ per ton. The 100-ton mill formerly belonging to the Pro Patria Co. and leased for 5 years, was remodeled at a cost of nearly \$30,000. A tube-mill, 5 Deister tables, 6 Callow tanks, 2 Callow screens and electrical equipment were installed in 1918.

Production: for 1917, 424 tons of copper ore, 1,826 tons of lead-zinc, 709 tons iron sulphide, and 1,687 tons lead-silver, all dry weights, net value, \$105,589. No work was reported for 1918, but company was operating in 1919 and 1920, shipping lead carbonate and pyrite.

RILLA MINING CO.

COLORADO

Mail returned unclaimed and company presumably out of business. Described in Volume XIV.

RITO SECO GOLD MINE

COLORADO

Fifty-one per cent. of stock owned by Assets Realizing Mines Corp. of California, which see.

Address: 811 Merchants National Bank Bldg., Los Angeles, Calif.

Property: about 800 acres, patented, near San Luis, in Costilla county. **Development:** shafts, tunnels, crosscuts and drifts, claimed to have proved 5,900,000 tons of ore, which will be mined by steam shovel and treated in a flotation plant, to have a capacity of 1,250 tons daily.

Idle, owing to high costs.

RITTENHOUSE MINE

COLORADO

Address: P. O. Box 36, Colorado Springs, Colo. A gold mine in Cripple Creek district. Teller county operated during part of 1920.

RIVER SMELTING & REFINING CO.

COLORADO

Affiliated with National Lead Co.

Works address: H. H. Utlev, mgr. and ore purchaser, Florence, Colo.; Louis V. Emanuel, supt.

Office: 722 Chestnut St., St. Louis, Mo.

Officers: Edw. J. Cornish, pres.; J. A. Caselton, sec.-treas.

Organized about 1913 jointly by National Lead and Stone & Webster, of Boston.

Operates a custom zinc smelter for treatment of complex Colorado ores, carrying zinc, lead, silver, gold and copper. Ores are reduced in a reverberatory furnace after partial desulphurization. Its products are zinc-

\$25 a ton. In other sections, silver is reported as running from 150 to 500 oz. per ton. Principal veins are in gneiss and pegmatite.

Development: by Sceptre tunnel, 3,200' long; Grant, 1,000' long, and Sunburst, 900'. A 380' raise from Sceptre to Grant and Sunburst tunnels was completed in 1918. The main tunnel was re-timbered in 1919, and lessees opened some rich silver ore.

Equipment: includes compressor, transformer, blacksmith shop. Aerial tram, 6,935' long connecting loading station with Col. & Southern R. R. at Georgetown, costing \$25,000, was completed early in 1919.

Operated by lessees; no shipments made in 1920.

SUN-MOON LEASING CO.

COLORADO

Fully described in Volume XIV. Mine operated by Hill Top S. M. Co., which see.

SUNNYSIDE GOLD MINES CO.

COLORADO

Defunct. Property taken over by The Sunnyside Mining & Milling Co., a subsidiary of the U. S. S. R. & M. Co.

SUNNYSIDE MINING & MILLING CO., THE

COLORADO

Fully described under own title in Vol. XIV. Subsidiary of the U. S. Smelting, Refining & Mining Co., which see.

SUNSET MILLING CO.

COLORADO

Address: Sunset, Colo.

Property: Lalla Rookh gold-silver mine at Sunset, Boulder county, operated during part of 1920.

SUN TUNGSTEN CO.

COLORADO

No work done since 1917. Was a G. R. Q. proposition and not favorably regarded. Described in Volume XIV.

SURETY GOLD MINING CO.

COLORADO

Address: Idaho Springs, Colo.

Property: the Orinoco gold-silver mine at Idaho Springs, Clear Creek county.

Operated during 1919-'20, and '21.

SWARTHMORE CONSOLIDATED MINING CO.

COLORADO

Officers: Chas. B. Galbreath, pres.; Harvey Hanes, v. p.; J. E. Carpenter, sec.; Paul Barriclow, treas., at last accounts.

Inc. July, 1907, in Colorado, as a merger of the Swarthmore Copper Co and Enterprise Mining Co. Cap. \$3,500,000; \$1 par.

Property: 17 claims, 11 patented, 60 acres, near Eldora, Boulder county, includes the Golden Fleece mine, having fissure veins in pre-Cambrian gneiss cut by dikes. Vein said to average 8' wide and to carry a paystreak of 3 to 5% copper ore with occasional telluride of gold.

Development: by 5 shafts, deepest 403', and by tunnels of 800', 1,000' and 2,000'.

Equipment: includes 2 small steam plants, a 60-h. p. hoist and a 12-drill air-compressor, a small concentrator with a 50-ton chlorination plant, and 4 mine buildings.

Property leased to Consolidated Leasing Co. since 1917.

SWEET HOME MINE

COLORADO

Address: Kasei & Bartos, lessees, Alma, Colo.

Property: at Alma, Park county, contains silver-copper-lead bearing ore. Operated during part of 1920.

SYNDICATE MINING & MILLING CO.

COLORADO

Mine office: Rico, Dolores county, Colo. Geo. E. Hicks, supt.

Is a reorganization of the Rico Mining Co., whose property was sold October 29, 1917, to a reorganization committee and transferred to the Synd. M. & M. Co., a corporation capitalized at \$500,000.

Property: 156 claims, 1,110 acres, with 20-acre mill site and 320 acres coal land, in the Pioneer district, Dolores county, includes the Group and Syndicate mines. Ore occurs in fissure veins as lime replacements. Veins are reported to vary from a few inches to 15' in width, traceable a mile long and to be proven to a depth of 700'. In one mine the ores carry 4% copper,

10% lead, 10% zinc and 10 oz. silver, the copper ore occurring as chalcopryrite associated with pyrite, sphalerite and galena in fluoritic gangue.

Development: by tunnels, 1,000 to 3,000' long. A crosscut tunnel was planned, 1919, to run through the group and to cut 3 veins. Equipped with 125 hydro-electric power at mine and 100-h. p. at mill. There are two 75-h. p. hoists, 2 compound air compressors, 10 air drills and 1 air electric drill; two 9 by 15" Blake crushers, 18 Wilfley tables, etc.

Production: up to 1918 estimated at 1,200,000 lb. copper. Operated and produced during 1919. No figures available.

TALISMAN MINE

COLORADO

Address: George Stahl, care Vindicator Consolidated G. M. Co., Independence, Teller county, Colo.

Property: about 5,000 acres directly N. of the main mineralized belt of Cripple Creek. Acting on the theory of W. H. Trask of Denver, in which he argues that below the granite overburden are valuable orebodies, diamond drilling is under way. By January 1921, the first hole on the Wild ranch was 1,357' deep, at 1,290' the drill entered 'dike' formation, showing fluorite, with a trace of gold. No 2 hole on the Talisman claim was 400' deep early in 1921; at 390' a phonolite dike, 7' wide, was cut; is to be sunk to 800'.

TAMASOA MINE

COLORADO

Address: Cicero Barber, Idaho Springs, Colo.

Property: at Idaho Springs, Clear Creek county, contains gold-silver-lead bearing ore. Operated during part of 1920.

TARBOX TUNNEL MINE

COLORADO

Address: J. L. Tarbox, Clayton, Ill.

Property: at Ward, Boulder county, contains gold-silver-bearing ore.

TAYLOR MINES CO.

COLORADO

Address: Central City, Colo.

Property: the Homer gold-silver mine, at Central City, Gilpin county. Operated during 1919 and 1920.

TAYLOR MOUNTAIN MINING CO.

COLORADO

Address: D. E. Cook, asst. sec., Chippewa Falls, Wis. Mine office: Garfield, Chaffee county, Colo. W. F. Norway, pres.

Inc. Oct., 1905, in Colorado. Cap. \$1,200,000; shares \$1 par. Annual meeting, in November.

Property: the Lily mine, 7 claims, 65 acres in the Monarch district, 1½ miles from Garfield and 19 miles from Salida. The property has a nearly vertical N.-S. contact vein, between granite and limestone, carrying lead and copper ores and showing copper ore which the management estimates to average 6% copper and 2 oz. silver per ton.

Development: by a 280' main shaft, with 4,000' of workings.

Equipment: includes electric power with 16-h. p. hoist and 35-h. p. air compressor. Shipments made in 1918.

TEK MINING, MILLING & LEASING CO.

COLORADO

Presumably defunct. See Volume XIV.

TELESCOPE MOUNTAIN MINING CO.

COLORADO

Address: 32 Midland Block, Colorado Springs, Colo.

Property: the Telescope mine at Chattanooga, San Juan county. Operations started in fall of 1917, but owing to internal difficulties among the stockholders and officials, mine was closed until April, 1918. The Maude vein on property said to show ore that assays 50% lead, 8-10 oz. silver, with small gold values. Development continued during 1919.

Equipment: includes compressor and power.

TENDERFOOT HILL CONS. MNG. CO. COLORADO-SO. DAKOTA

Office: 317 Exchange Nat'l. Bank Bldg., Colorado Springs, Colo.

Officers: W. A. Otis, pres.; L. L. Aitken, v. p.; A. D. Aitken, sec.; Russell H. Forbes, treas.

Cap. \$1,500,000; \$1 par; all issued. Listed on Colorado Springs Stock Exchange. No liabilities and no production. Cash in treasury, January 1, 1919, \$11,036; securities, \$3,675.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

MINERAL RESOURCES

OF THE

UNITED STATES

CALENDAR YEAR

1912

PART I—METALS



WASHINGTON
GOVERNMENT PRINTING OFFICE
1913

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COSTILLA COUNTY.

*Grayback district.*¹—The Colorado Gold Dredging Co.'s Hammond dredge of the close connected type, of 54 buckets of 4 cubic feet capacity each, which was overturned in 1911, was not in operation in 1912. A little gold was recovered by sluicing in the district. Assessment work was done on several lode prospects.

CUSTER COUNTY.

From 8 mines in Custer County in 1912 there were sold or treated 4,330 tons of ore, from which were recovered \$16,898 in gold; 25,426 ounces of silver, valued at \$15,637; 2,008 pounds of copper, valued at \$331; and 10,444 pounds of lead, valued at \$470, a total value of \$33,336, as compared with \$13,538 in 1911. All the metals except lead increased in value.

With the exception of several lots of lead and copper ores, the tonnage was dry or siliceous ore. The greater part of the ore was milled and the remainder was shipped to smelters.

Crude gold-silver ore was shipped to smelters from the Bassick mine, and lessees treated old tailings from the dump in a 35-ton cyanide plant. Smelting ore was shipped from the Hector and from the Whistle mine, at Rosita, and from the King of the Carbonates, Maxine Elliott, S. A. K., Troy, and Vanderbilt mines, at Westcliffe.

Some development work was done on the copper-lead-zinc sulphide ore body² of the Marion Mines & Mill Co., at Fairview, 45 miles southwest of Pueblo. The mill was idle.

DOLORES COUNTY.

Production of gold, silver, copper, lead, and zinc in Dolores County, Colo., 1904-1912.

Year.	Number of producing mines.	Tonnage.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.	Average total value per ton.
		Short tons.		Fine ounces.	Pounds.	Pounds.	Pounds.		
1904.....	10	7,727	\$41,391	100,194	12,201	260,584	145,060	\$118,928	\$15.39
1905.....	5	3,820	34,766	76,526	119,821	840,319	1,500,000	227,675	59.51
1906.....	8	2,242	9,398	34,290	109,379	118,229	22,508	78,904	35.22
1907.....	8	1,575	11,689	33,037	99,495	51,547	12,649	57,029	36.21
1908.....	5	11,021	37,238	163,563	42,495	947,062	509,184	193,281	17.53
1909.....	10	4,787	22,266	103,646	43,538	462,373	167,574	110,753	23.14
1910.....	13	2,933	15,327	88,309	97,063	127,009	37,000	85,667	29.21
1911.....	12	3,276	7,565	56,202	3,288	701,244	525,333	99,263	30.30
1912.....	7	8,485	7,556	100,288	689,915	1,212,400	812,029	293,658	34.60
Increase (+) or decrease (-).	-5	+5,269	-9	+44,086	+686,627	+511,156	+286,620	+194,395	+4.30

Dolores County in 1912 produced 8,485 short tons of ore, yielding \$7,556 in gold; 100,288 ounces of silver, valued at \$61,677; 689,915 pounds of copper, valued at \$113,837; 1,212,400 pounds of lead, valued at \$54,558; and 812,029 pounds of zinc, valued at \$56,030,

¹ See Julian, Charles, Gold dredging in Costilla County, Colo.: Min. Sci., May 25, 1911, pp. 540-542. Also, Patton, Smith, Butler, and Hoskins, Geology of the Grayback mining district, Costilla County, Colo.: Bull. Colorado State Geol. Survey for 1909, No. 2, 1910.

² See Partridge, H. C., Zinc-ore dressing in Colorado: Metall. and Chem. Eng., Oct., 1910, pp. 566-570.

with a total value of \$293,658, as compared with \$99,263 in 1911. The gold yield remained stationary, but there were large increases in both quantity and value for the other metals.

Lone Cone (Dunton) district.—The Emma mine was again the only important producer in this district. The ore from this mine carries chiefly gold and silver, and the greater part was concentrated in the company's mill, the remainder being shipped to smelters. A small lot of copper ore was shipped from the Rosebud mine.

Pioneer (Rico) district.—This district in 1912 produced 6,819 short tons of ore, yielding \$1,316 in gold, 68,794 ounces of silver, 689,139 pounds of copper, 1,207,535 pounds of lead, and 812,029 pounds of zinc, with a total value of \$267,702, as compared with \$77,125 in 1912. The ore was lead, lead-zinc, and copper, and all was shipped from the district, the bulk of the ore going to smelters near Salt Lake City, and some to Durango, Pueblo, and Salida. Some of the ore shipped to Midvale, Utah, was concentrated by electrostatic separators and some to the Western Chemical Co., Denver, was concentrated by magnetic and wet milling. The Rico-Wellington group was the principal producing property. The public report of this company states:

That ore production consisted of lead ore, 463 tons, worth \$11,477; copper ore, 4,596 tons, worth \$79,657; zinc ore, 1,068 tons, worth \$20,389; a total value of \$111,523. * * * Development covered 3,822 feet, and about 11,000 tons of lead-zinc ore is ready for mining. * * * The Pro Patria mill, belonging to the Rico Mining Co., has been leased for five years; \$30,000 is being spent on remodeling the mill and power plant.*

Other producing mines were the Badger, Lillian D., Rico Argentino group, and Rico Mining Co. group.

DOUGLAS COUNTY.

A small quantity of placer gold was recovered by sluicing in Newlins Gulch, near Parker, in Douglas County, in 1912.

EAGLE COUNTY.

Production of gold, silver, copper, lead, and zinc in Eagle County, Colo., 1904-1912.

Year.	Number of producing mines.	Tonnage.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.	Average value per ton.
		Short tons.		Fine ounces.	Pounds.	Pounds.	Pounds.		
1904.....	10	1,860	\$30,460	21,011	27,042	323,969	3,080	\$60,195	\$32.26
1905.....	9	12,049	46,891	46,487	29,331	156,723	2,915,025	258,897	21.47
1906.....	16	15,986	51,561	94,912	130,233	307,755	1,065,082	222,799	13.94
1907.....	15	4,191	53,641	70,586	14,270	193,690	507,949	143,317	34.20
1908.....	10	3,008	58,131	86,715	66,141	11,204		113,292	37.62
1909.....	16	11,526	53,308	125,214	286,885	152,280	740,408	202,244	17.45
1910.....	13	27,761	25,231	94,313	208,551	397,409	4,147,945	341,008	12.27
1911.....	11	33,177	41,180	116,109	68,608	855,889	5,097,597	440,102	13.26
1912.....	19	34,164	49,294	163,735	147,176	1,240,156	5,659,261	620,571	18.16
Increase (+).	+8	+987	+8,134	+47,620	+80,568	+384,267	+561,664	+180,469	+4.90

Eagle County, in 1912, produced 34,164 short tons of ore containing \$49,294 in gold; 163,735 ounces of silver, valued at \$100,697; 147,176 pounds of copper, valued at \$24,284; 1,240,156 pounds of lead, valued

* Min. & Sci. Press, Mar. 8, 1913, p. 392.

† Includes placer production.

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

MINERAL RESOURCES

OF THE

UNITED STATES

CALENDAR YEAR

1913

PART I—METALS



WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

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lead and iron concentrates, and a small tonnage of zinc concentrates, were sent to smelters. On the south side of Clear Creek the Little Mattie mine was an important producer, with an increased tonnage both to the company's mills and to smelters. A small tonnage from the Gladstone mine was concentrated or sent to smelters. Only a small tonnage was mined from the Stanley mines. The Hoosac mine and new mill were operated for a short time. Several lots were shipped from the Almaden mine on Fall River.

In the Jackson and Cascade districts producing mines were the Black Eagle, Chicago Mountain, Dorit, Humboldt, and P. T.

Montana (Dumont and Larson) district. The Montana district in 1913, from 10 mines, produced 971 tons, carrying \$1,330 in gold, 22,919 ounces of silver, 76 pounds of copper, and 175,188 pounds of lead, with a total value of \$22,893, as against \$18,754 in 1912. The principal producing mine was the Blue Ridge, the output being lead ore to smelters and dry concentrates carrying lead, silver, and some gold from the concentration plant on the property. Smelting ore was shipped from the Commodore, Millington, and Plattz mines.

Trail Creek (Lamartine and Freeland) district.—The Trail Creek district in 1913, from 7 mines, produced 5,845 tons, yielding \$52,201 in gold, 15,952 ounces of silver, 2,730 pounds of copper, 165,815 pounds of lead, and 56,265 pounds of zinc, with a total value of \$72,706, as against \$92,427 in 1912. Lead-zinc ore from the Ben Harrison mine was concentrated at the Newton mill, yielding lead and lead-zinc concentrates. Milling and smelting ores were shipped from the Lamartine-Money Musk group. The output of both milling and smelting ore from the Centurion-Rockford and other properties of the North American Smelter & Mines Co. decreased heavily. Ore from the Oneida mine was sent to custom mills or to smelters. The tonnage from the New Era mine was treated at its mill and crude ore shipped to smelters increased.

CONEJOS-RIO GRANDE COUNTIES.

*Platora-Gilmore-Summit district.*¹—Prospecting and some development work was done in the reopening of this district, which is 45 miles southwest of Monte Vista, near the Rio Grande-Conejos County line. A ton test lot of ore was shipped by the Gaudaloupe Co. of Platora and 200 pounds from the Smuggler claim, near Stunner, was tested at the Woods testing plant, at Denver.

COSTILLA COUNTY.

*Grayback district.*²—A small quantity of gold was recovered by sluicing in the district.

CUSTER COUNTY.

From 7 mines in Custer County in 1913 there were sold or treated 4,662 tons of ore, from which were recovered \$14,648 in gold, 11,313

ounces of silver, valued at \$6,833; 4,052 pounds of copper, valued at \$628; and 5,273 pounds of lead, valued at \$232, with a total value of \$22,377, as compared with \$33,336 in 1912. The yield of all the metals except copper decreased. The greater part of the ore was treated by cyanidation and the remainder was shipped to smelters.

Dump ore from the Bassick mine was treated in the 35-ton cyanide plant at Ilse. Smelting ore was shipped from the Bismuth, Delaware, Delia, King of the Carbonates, and Twenty-Six mines at Westcliffe.

The Terrible mine³ near Ilse, was unwatered during 1913, but no output was made.

DOLORES COUNTY.

Production of gold, silver, copper, lead, and zinc in Dolores County, Colo., 1904-1913.

Year.	Number of producing mines.	Tonnage.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.	Average total value per ton.
		Short tons.		Fine ounces.	Pounds.	Pounds.	Pounds.		
1904.....	10	7,727	\$41,391	100,194	12,201	260,584	145,060	\$118,928	\$15.39
1905.....	5	3,820	34,760	76,526	119,821	840,319	1,500,000	227,675	59.61
1906.....	8	2,242	9,398	34,290	199,379	118,229	22,506	78,904	35.22
1907.....	8	1,575	11,689	33,037	99,495	54,547	12,649	57,029	36.21
1908.....	5	11,024	37,238	163,563	42,495	947,962	508,184	193,281	17.53
1909.....	10	4,787	22,266	103,646	43,538	482,373	187,574	110,753	23.14
1910.....	13	2,933	15,327	88,309	97,063	127,909	87,000	85,667	29.21
1911.....	12	3,276	7,565	56,202	3,288	701,244	625,333	99,263	30.30
1912.....	7	8,485	7,550	100,298	689,915	1,212,400	812,029	293,658	34.60
1913.....	8	17,802	12,432	178,816	801,819	3,079,341	2,596,232	625,599	29.52
Increase (+) or decrease (-).....	+1	+9,317	+4,876	+78,528	+111,904	+1,866,941	+1,784,203	+231,941	-5.08

Dolores County in 1913 produced 17,802 short tons of ore, yielding \$12,432 in gold; silver, valued at \$108,005; copper, at \$124,282; lead, at \$135,491; and zinc, at \$145,389, with a total value of \$525,599, as compared with \$293,658 in 1912.

Lone Cone (Dunton) district.—The Emma mine continued to be the only important producer in the Lone Cone district. The ore from this mine carries chiefly gold and silver; the greater part was concentrated in the company's mill, the remainder being shipped to smelters. A small tonnage of ore carrying silver and copper was shipped from the Rosebud mine and from the Liberty Trust mine.

Pioneer (Rico)⁴ district.—This district in 1913 produced 17,272 tons, yielding \$6,332 in gold, 153,111 ounces of silver, 800,375 pounds of copper, 3,075,745 pounds of lead, and 2,596,232 pounds of zinc, with a total value of \$503,591, as compared with \$267,702 in 1912. The ore was lead, lead-zinc, copper, and iron; part of the lead-zinc ore was concentrated at Rico, and part was shipped to Coffeyville, Kans.; the lead and copper ore went to smelters near Salt Lake City, and some to Durango, Pueblo, and Salida; and the iron ore was shipped to Vanadium, for use in the treatment of vanadium

¹ For discussion of geology of the district see Hunter, J. F., Some cerussite deposits in Custer County, Colo.: U. S. Geol. Survey Bull. 580, pp. 25-37, 1914.

² For discussion of geology see Ransome, F. L., The ore deposits of the Rico Mountains, Colorado, U. S. Geol. Survey, Twenty-second Ann. Rept., pt. 2, pp. 229-308, 1901.

³ For discussion of the geology of the district see Hills, R. C., Ore deposits of the Summit district, Rio Grande County, Colo.: Colorado Sci. Soc. Proc., vol. 1, pp. 20-30, 1883. Raymond, R. W., Mines and mining west of the Rocky Mountains, vol. 10, p. 329, 1875. Emmons, W. H., The enrichment of sulphide ores: U. S. Geol. Survey Bull. No. 329, p. 226, 1913.

⁴ For discussion of geology see Patton, Smith, Butler, and Hoskins, Geology of the Grayback mining district, Costilla County, Colo.: Colorado State Geol. Survey Bull. for 1909, No. 2, 1910.

⁵ For discussion of geology see Cross, Whitman, Geology of Silver Cliff and the Rosita Hills, Colorado: U. S. Geol. Survey Seventeenth Ann. Rept., pt. 2, pp. 203-403, 1896, and Emmons, E. F., The mines of Custer County: Idem, pp. 405-472.

ores. The Rico-Wellington group was the principal producing property. The public report of this company states:

The remodeling of the Pro Patria mill, on which we have a five-year lease, and started during 1912, was completed during the early part of 1913 * * *. 5,178 tons of lead-zinc ore have been milled * * *. We have made into concentrate sand middlings (including 270 tons of middlings) over 92 per cent of the product sent to the mill. Ore production, lead ore, 786 dry tons, \$19.09 per ton; copper ore, 4,804 dry tons, \$9.73 per ton; lead concentrates, \$36.20 per ton; zinc concentrates, \$13.22 per ton; zinc middlings, \$8.88 per ton.

Lessees (including the Rico Argentine Co.) on the Rico Mining Co.'s group also produced a large tonnage of ore of various classes. Some iron ore was shipped to Vanadium, Colo., for use in the treatment of vanadium ores.¹ Other producing mines were the Sambo, David M., South Park, and Lucky Boy.

DOUGLAS COUNTY.

A small quantity of placer gold was recovered by sluicing in Newlin Gulch, near Parker, in Douglas County, in 1913.

EAGLE COUNTY.

Production of gold, silver, copper, lead, and zinc in Eagle County, Colo., 1904-1913.

Year.	Number of producing mines.	Tonnage.	Gold. ^a	Silver. ^a	Copper.	Lead.	Zinc.	Total value.	Average value per ton.
		Short tons.		Fine ounces.	Pounds.	Pounds.	Pounds.		
1904.....	10	1,500	\$30,460	21,011	27,042	321,069	3,080	\$60,195	\$32.28
1905.....	9	12,019	46,891	46,487	29,331	156,723	2,915,025	258,897	21.47
1906.....	16	13,986	51,561	91,912	130,233	307,755	1,065,082	222,799	13.94
1907.....	15	4,191	53,641	70,566	14,270	193,690	507,949	143,317	14.20
1908.....	10	3,009	58,131	86,715	66,141	11,204	.....	113,292	37.62
1909.....	10	11,526	53,308	125,214	280,885	152,280	740,408	202,244	17.45
1910.....	13	27,761	25,231	98,313	209,551	397,409	4,147,945	341,008	12.27
1911.....	11	31,177	41,160	116,109	66,608	855,889	5,097,597	440,102	13.28
1912.....	19	31,164	49,294	163,735	147,170	1,210,156	8,659,261	620,571	18.18
1913.....	29	47,488	41,220	301,340	41,368	1,351,208	6,683,643	663,403	13.97
Increase (+) or decrease (-).....	+10	+13,321	+8,071	+137,645	+105,808	+111,049	+1,024,382	+42,832	+5.19

^a Includes placer production.

Eagle County in 1913 produced 47,488 tons of ore, yielding \$41,220 in gold; silver, valued at \$182,034; copper, at \$6,412; lead, at \$59,453; zinc, at \$374,284—a total value of \$663,403, as compared with \$620,571 in 1912. The yield of silver for the county increased 137,645 ounces, owing to the output of the new silver district at Eagle; the yield of zinc increased 1,024,382 pounds. The county maintained its place as third in the production of zinc, almost equaling Summit County's zinc yield. There were 29 producing deep mines, as against 19 producing mines, 1 of which was placer, in 1912. Both the tonnage shipped to separating mills and to smelters increased.

Battle Mountain district.—With an increase in the capacity of the magnetic separation mill from 80 tons to 120 tons per day in 1912, an increased tonnage of lead-zinc sulphide ore was mined and milled

in 1913 from the Iron Mask group. The output was zinc, lead, and iron concentrates. The crude ore milled carries about as follows: 1 to 5 per cent lead, 17 per cent zinc, 30 per cent iron, 26 per cent sulphur, and 2 per cent silica.* Some lead oxidized ore was also shipped in 1913. Lessees on the Champion and Ground Hog mines shipped dry gold-silver sulphide, lead sulphide, and copper sulphide ores. Lead sulphide ore, dry silver ore, and lead-zinc sulphide ore were shipped from the Wilkesbarre mine by lessees. Other mines of importance from which ore was shipped were the Bleak House, Foster Combination, and Alleghany mines, Pine Martin, Star of the West, and Tip Top.

Eagle or Brush Creek district.—From this new district, on Brush Creek, a considerable tonnage of silver ore was shipped to smelters from the Lady Belle and North Dakota mines.

Girard Mountain district.—A small tonnage of copper ore was shipped from the Black Tiger and from the California mine.

Holy Cross district.—Small lots of gold-silver ore of good grade were shipped from the Alaska, Gold Bug, and Spread Eagle mines.

Mount Egley district.—A small tonnage of gold-silver ore of good grade was shipped from the Ohio mine.

EL PASO COUNTY.

Blair Athol district.—From a surface deposit of copper oxidized ore in sandstone at Blair Athol, about 6 miles north of Colorado City, several cars of ore and concentrates (made with the Hardwick hydraulic concentrator) were shipped.

FREMONT COUNTY.

A small tonnage of lead-zinc ore from the Gumaer mine at Coto-paxi was shipped to Denver, and of copper ore from the Farrell mine at Parkdale was shipped to Omaha.

GARFIELD COUNTY.

A small tonnage of gold-silver ore, carrying a good commercial content of gold, was shipped from the Gray Eagle mine, near Newcastle.

GILPIN COUNTY.

Production of gold, silver, copper, lead, and zinc in Gilpin County, Colo., 1904-1913.

Year.	Number of producing mines.	Tonnage.	Gold. ^b	Silver. ^b	Copper.	Lead.	Zinc.	Total value.	Average value per ton.
		Short tons.		Fine ounces.	Pounds.	Pounds.	Pounds.		
1904.....	55	109,557	\$1,104,833	335,354	604,791	125,731	113,000	\$1,395,023	\$12.73
1905.....	66	182,873	1,450,033	340,901	812,270	619,841	191,574	1,771,588	9.69
1906.....	90	114,662	1,115,902	242,478	638,002	810,791	.....	1,430,611	12.48
1907.....	84	87,887	938,458	209,347	374,060	611,060	.....	1,283,555	14.55
1908.....	112	120,761	1,075,808	187,030	636,371	538,143	.....	1,281,537	10.61
1909.....	244	111,118	887,311	172,010	499,146	604,581	.....	1,070,222	9.63
1910.....	162	83,651	687,032	132,635	534,214	675,177	.....	852,685	10.19
1911.....	162	105,028	778,774	202,659	650,249	1,239,350	23,098	1,109,750	10.77
1912.....	151	118,632	904,638	310,205	1,025,770	1,331,600	25,377	1,330,796	11.22
1913.....	122	91,156	637,101	273,207	837,974	1,210,341	8,589	1,033,710	11.00
Decrease(-).....	-29	-24,406	-217,404	-42,998	-187,790	-141,259	-16,783	-295,056	-0.23

* Hanington, C. H., Colorado State Bur. Mines, Twelfth Bienn. Rept., 1911-12, p. 73, 1913.

^b Includes placer production.

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¹ For discussion of treatment of vanadium ores see Moore, R. B., and Kithil, K. I., A preliminary report on uranium, and vanadium: Bur. Mines, Bull. 70, p. 74, 1914.

DEPARTMENT OF THE INTERIOR

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UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

MINERAL RESOURCES

OF THE

UNITED STATES

1914

H. D. McCASKEY

Geologist in Charge, Division of Mineral Resources

PART I—METALS

H. D. McCASKEY, Geologist in Charge



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DOLORES COUNTY.

Mine production of gold, silver, copper, lead, and zinc in Dolores County, Colo., in 1913 and 1914.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
1913.	8	Short tons. 17,842	\$12,432	Fine ounces. 178,810	Pounds. 801,819	Pounds. 3,079,341	Pounds. 2,536,212	\$525,699
1914.	10	6,905	7,973	80,526	350,278	492,023	366,549	140,292
Increase (+) or decrease (-).	+2	-10,937	-4,459	-92,290	-451,541	-2,587,318	-2,229,683	-385,307

* Includes placer production.

Dolores County in 1914 produced 6,905 tons of ore, yielding \$7,973 in gold; silver, valued at \$47,849; copper, at \$46,587; lead, at \$19,189; and zinc, at \$18,694—a total value of \$140,292, as compared with \$525,559 in 1913.

Lone Cone (Dunton) district.—A small shipment of ore was made from the Emma mine.

Pioneer (Rico) district.—This district in 1914 produced 6,864 tons of ore, yielding \$6,542 in gold, 80,844 ounces of silver, 350,196 pounds of copper, 491,177 pounds of lead, and 366,549 pounds of zinc, with a total value of \$135,675, as compared with \$503,301 in 1913. The ore was lead, lead-zinc, copper, and iron; part of the lead-zinc ore was shipped to the Sutton, Steele & Steele plant, part to the Western Chemical Co., Denver, and part to Coffeyville, Kans.; the lead and copper ore went to smelters at Durango, Ouray, Pueblo, and Salida, Colo., and Salt Lake City, Utah; and the iron ore was sold for its iron contents alone, for use in the treatment of vanadium² ores, at Vanadium, Colo.

The Rico-Wellington group was the principal producing property. The public report of this company states:

Early in 1914 we found it necessary to discontinue shipments of copper ore until arrangements could be made with the railroad for a reduction in freight rates. This was allowed, and we started to ship on our new rate July 23, 1914, shipping two cars a day until August 12, when the smelters stopped quotations on copper and silver on account of the war. We have done 2,004 feet of work during the year, the biggest part of which is development and prospect work in new territory. We have succeeded in opening up and shipping a fair tonnage of carbonate ore from new ground and we believe from the information gained in mining this ore that we shall be able to open up still more in the future. We have also found two new beds of copper ore in new territory paralleling the old stopes, but farther away from the fissure and nearer the surface than any copper ore so far discovered. The first copper strike was made in an upraise from the main Wellington tunnel in about 850 feet from the portal and 63 feet above the tunnel level. The second strike was made in another upraise about 150 feet beyond the first raise and 93 feet above the main level. A drift was made from the top of each raise and the ore beds were found one directly above the other. * * *

There is also a large percentage of the ore reserve reported in 1913 annual report still untouched, awaiting better market conditions. In addition to this we have a large tonnage (estimated at several hundred thousand tons) of almost pure iron sulphide,

¹ For discussion of geology see Ransome, F. L., The ore deposits of the Rico Mountains, Colorado: U. S. Geol. Survey Twenty-second Ann. Rept., pt. 2, pp. 229-398, 1901.
² For discussion of treatment of vanadium ores see Moore, R. B., and Kithill, K. L., A preliminary report on uranium and vanadium: U. S. Bur. Mines Bull. 70, p. 74, 1914.

GOLD, SILVER, COPPER, LEAD, AND ZINC—COLORADO.

carrying about 2 per cent copper and 3 ounces of silver, which we expect to be able to treat locally as soon as the company's finances will allow us to complete tests already started and to install the necessary equipment.

Total footage development for 1914	Feet. 2,004
Previous footage	12,963

Total footage kept in repair to date..... 14,967

ORE PRODUCTION.

Copper ore:	Short tons.
Moist weight	2,885.28
Moisture (4.499 per cent)	107.81

Dry weight..... 2,277.97

Lead ore:	
Moist weight	2,045.89
Moisture (21.6 per cent)	441.84

Dry weight..... 1,603.55

Iron ore:	
Moist weight (sold at flat rate per moist tons)	656.26

Zinc concentrates:	
Moist weight	71.24
Moisture (5.5 per cent)	3.92

Dry weight..... 67.32

NET VALUES.

Copper ore	\$15,194.83, or \$6.6703 a ton.
Lead ore	12,436.04, or 7.7865 a ton.
Iron ore	2,547.04, or 3.8811 a ton.
Zinc concentrates	38.06, or .5653 a ton (royalty only).

30,265.97

Lessees (including the Rico-Argentino Co.) on the Rico Mining Co.'s group also shipped a large quantity of ore of various classes. Other producing mines were the Badger, David, Iron, Lillian D., Newman, Rico Consolidated group, and South Park.

DOUGLAS COUNTY.

A small quantity of placer gold was recovered by sluicing in Newlins Gulch, near Parker, in Douglas County, in 1914.

EAGLE COUNTY.

Mine production of gold, silver, copper, lead, and zinc in Eagle County, Colo., in 1913 and 1914.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
1913.	29	Short tons. 47,488	\$41,220	Fine ounces. 301,380	Pounds. 41,368	Pounds. 1,351,205	Pounds. 6,683,613	\$663,403
1914.	24	49,377	47,194	127,080	28,105	1,177,355	7,522,098	550,752
Increase (+) or decrease (-).	-5	+1,889	+5,974	-171,300	-13,263	-173,820	+839,455	-112,651

¹ Ores sampled Jan. 1 to Dec. 31, 1914.

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Geologist in Charge, Division of Mineral Resources

PART I—METALS
H. D. McCaskey, Geologist in Charge



WASHINGTON
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1917

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mined from the Golden Edge mine and shipped to smelters and various mills. Some ore was also shipped from the Sun and Moon group. An increased output of ore from mines in Gilpin County—the Tremont (formerly called Gunnell), Pozo-Dyke, and Kansas mines—was trammed through the Argo tunnel and sold or treated at Idaho Springs. The output and the recovered metals from this ore are credited to Gilpin County. At the mouth of the Argo tunnel, the Argo 20-stamp cyanidation and concentration mill was operated steadily. Experimentation in the use of the froth flotation process begun in 1915 at this mill resulted in the complete abandonment of the cyanide process and the installation of the flotation process in June, 1916. Ore from the Franklin mine, in Gilson Gulch, was shipped to the sampler. A small quantity of ore from the Idaho-Bride mine (worked through the Idaho tunnel) was milled at the reconstructed Mixsell mill. On the south of Clear Creek, the Little Mattie mine continued to be an important producer of ore which was sent to smelters and to its own amalgamation and concentration mill. A small output of smelting ore was made from the Gladstone mine. Several small lots of ore from the Quito mine were concentrated. Lessees on the Stanley mine shipped a small quantity of ore to the sampler or to custom mills. A small production was made from the Lincoln mine. Several lots of silver-lead ore were shipped from the Almaden mine, on Fall River.

A small production was made from the Humboldt mine, in the Cascade district.

The mills operated at Idaho Springs in 1915 were the Argo, Combination, Hudson, Jackson, Payne (Mixsell), and Newton.

Montana (Lawson and Dumont) district.—The Montana district in 1915, from 10 mines, produced 283 tons of ore, carrying \$3,925 in gold, 2,834 ounces of silver, 9,274 pounds of copper, and 11,896 pounds of lead, with a total value of \$7,544, as against \$11,209 in 1914. All but a small quantity of ore went to smelters. Producing mines were the Albion, Avalanche, Heliotrope, Platts, Princess, Senator, Skidoo, Silver Treasure, and Syndicate.

Trail Creek (Lamartine and Freeland) district.—The Trail Creek district in 1915, from 7 mines, produced 20,594 tons of ore, yielding \$50,300 in gold, 19,548 ounces of silver, 11,520 pounds of copper, and 107,383 pounds of lead, with a total value of \$67,274 as against \$47,411 in 1914.

The Oneida 50-ton concentration and cyanide mill, placed in operation in December, 1914, was operated as a cyanidation mill for only two months when froth-flotation superseded cyanidation. It was then operated continuously throughout the year. The New Era 25-ton concentration plant was operated from March until November. Lessees operating the Lamartine mine shipped ore to the sam-

¹ For description see U. S. Geol. Survey Mineral Resources, 1912, pt. 1, p. 653, 1913; Eng. and Min. Jour., Aug. 30, 1913, pp. 385-389; and Colorado State Bur. Mines Twelfth Bienn. Rept., 1911-12, p. 80, 1913.
See also Roller, A. H., and Curran, H. T., Ore treatment at the Argo mill: Eng. and Min. Jour., p. 1, July 4, 1914.
Eng. and Min. Jour., Aug. 1, 1914, p. 217.
Pearce, J. A., Cyanidation of Clear Creek and Gilpin County sulphides: Min. and Sci. Press, Nov. 28, 1914, pp. 833-837.
Heizer, O. F., Colorado State Bur. Mines Thirteenth Bienn. Rept., 1913-14, pp. 87-90, 1914.
Larmee, H. C., Cyanidation of low-grade sulphide ores in Colorado: Met. and Chem. Eng., July, 1915, pp. 421-425.
Pearce, J. A., Flotation versus cyanidation: Met. and Chem. Eng., July 15, 1916, pp. 700-708; Flotation tribulations: Min. and Sci. Press, Sept. 10, 1916, pp. 427-430.

GOLD, SILVER, COPPER, LEAD, AND ZINC—COLORADO.

pler at Idaho Springs and to the 50-ton concentration plant on the property. Several shipments of gold ore were made from the United Freeland mine, and small shipments were made from the Donaldson and Gum Tree mines.

CONEJOS AND RIO GRANDE COUNTIES.

Platoro-Gilmore-Summitville district.—In the Summitville district, Rio Grande County, an important production of gold bullion was derived from operations on the Bonanza mine, and a small shipment of gold ore was made from the Belmont mine. No work was done on the property of the Guadalupe Mining Co. since Jasper.

In Conejos County development work was done at the property of the Smuggler-Sunbeam Co.

COSTILLA COUNTY.

*Grayback district.*²—No production was made in this district in 1915.

CUSTER COUNTY.

From 23 mines in Custer County in 1915 there were sold or treated 1,719 tons of ore, from which were recovered \$4,098 in gold; 31,633 ounces of silver, valued at \$16,088; 12,640 pounds of copper, valued at \$2,212; 89,808 pounds of lead, valued at \$4,221; and 30,411 pounds of zinc, valued at \$3,771; a total value of \$30,340, as compared with \$13,268 in 1914. There were increases in all the metals, that of silver being the largest. The greater part of the ore from this county was shipped to smelters.

At Ilse dump ore from the Bassick mine was treated in the 35-ton cyanide plant. Small shipments of ore to smelters were made from the Bassick, Miners Delight, and Terrible⁴ mines. At Silver Cliff smelting ore was shipped from the Augustin, Bull Domingo, Clarita, Herman, King of the Carbonates, Last Chance, Nodoway, Passiflora, Pioneer, Precipitate, Quartz King, Twenty-Six, Van Emmet, and White mines.

DOLORES COUNTY.

Mine production in Dolores County, Colo., in 1914 and 1915.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
		Short tons.		Fine oz.	Pounds.	Pounds.	Pounds.	
1914.....	10	6,905	\$7,973	88,626	350,278	492,023	388,549	\$140,292
1915.....	10	14,192	11,932	127,933	1,032,480	268,447	35,936	274,551
Increase or decrease, 1915.....		+7,287	+3,959	+41,407	+682,202	-223,576	-330,613	+134,259

¹ For discussion of the geology of the district see Hills, R. C., Ore deposits of the Summit district, Rio Grande County, Colo.: Colorado Sci. Soc. Proc., vol. 1, pp. 20-30, 1883; Raymond, R. W., Mines and mining west of the Rocky Mountains, vol. 10, p. 329, 1875; Emmons, W. H., The enrichment of sulphide ores: U. S. Geol. Survey Bull. 529, p. 226, 1913.

² For discussion of geology see Patton, Smith, Butler, and Hoskins, Geology of the Grayback mining district, Costilla County, Colo.: Colorado State Geol. Survey Bull. for 1909, No. 2, 1910.

³ For discussion of geology see Cross, Whitman, Geology of Silver Cliff and the Route Hills, Colo.: U. S. Geol. Survey Seventeenth Ann. Rept., pt. 2, pp. 265-403, 1896, and Emmons, R. F., The mines of Custer County: Idem, pp. 405-472.

⁴ For discussion of geology see Hunter, J. F., Some cerussite deposits in Custer County, Colo.: Bull. 580, pp. 25-37, 1914.

RIC000001048

Lake County (Leadville and outlying districts) produced gold, silver, copper, lead, and zinc having a total gross value of \$13,839,401, the largest since 1883, and an increase for the year of \$4,782,104. The Arkansas Valley lead smelter, to which many improvements had been made, was operated steadily. The zinc-oxide plant, unsuccessful in 1914, was actively operated on zinc carbonate ores of 16 per cent or less. The Pingrey concentration-flotation plant was also operated steadily and the Empire Zinc Co.'s concentration magnetic-separation mill at Canon City was operated with increased capacity on Leadville zinc sulphide ores, as was the Western Chemical Co.'s wet concentration magnetic-separation plant at Denver. The unwatering of the Downtown districts by electric pumps reached a depth of 700 feet at the Penrose shaft, and a consolidation of Fryer Hill claims led later to the installation of electric pumps at the Harvard shaft. Considerable interest was shown in the development work centering on Prospect Mountain, an increased output was made from the Dolly B. Polaris-Vega mines at the heading of the Yak tunnel, and a small output was made from Iowa Gulch mines. A dredge installed on Arkansas River, below Malta, produced \$69,009 in placer gold in 70 days, the yardage handled averaging 47½ cents. The Lackawanna Gulch district continued to ship bullion and high-grade gold ore and concentrates, and silver ore in quantity continued to be shipped from the Sugar Loaf district. Zinc carbonate ore was mined and shipped from Weston Pass.

Eagle County's output came chiefly from Red Cliff, but included also a considerable quantity of silver from the Brush Creek district. The value of the output for 1915 was the largest since the discovery of ore at Red Cliff in 1879 and exceeded that of 1914 by more than \$1,000,000. The value of the zinc alone was \$1,381,577.

Summit County dredges and placers produced gold almost equal to the output in 1914, and the production of zinc in quantity and particularly in value greatly exceeded any previous record.

Park County's output of placer gold decreased greatly, but its output of gold and zinc from deep mines increased.

The Pitkin County (Aspen) output showed an increase in silver but a decrease in lead.

Gunnison County's output showed an important increase in gold and a large increase in zinc.

Chaffee County's output showed small changes in gold, silver, copper, and lead but a heavily increased output of zinc.

Fremont County continued to produce an appreciable quantity of copper and materially increased its output of zinc. There were increases for all metals from Custer County, but Saguache County mines were not so active as in 1914. Operations at Summitville, Rio Grande County, produced considerable gold.

The San Juan region of Dolores, La Plata, Ouray, San Juan, and San Miguel counties produced \$3,854,521 in gold, 2,278,201 ounces of silver, 3,517,462 pounds of copper, 14,314,363 pounds of lead, and 3,342,565 pounds of zinc, with a total value of \$6,712,378, as compared with \$3,069,857 in gold, 2,515,437 ounces of silver, 2,379,639 pounds of copper, 11,861,766 pounds of lead, and 1,382,334 pounds of zinc, with a total value of \$6,210,494, in 1914.

Mineral County (Creede) showed a heavy decrease in silver, which was not equalized in value by the increase in gold and lead.

Boulder, Gilpin, and Clear Creek counties produced 214,823 tons of ore, yielding \$1,249,894 in gold, 790,065 ounces of silver, 1,094,010 pounds of copper, 4,008,744 pounds of lead, and 1,516,032 pounds of zinc, with a total value of \$2,218,308, as compared with 168,796 tons of ore, yielding \$1,167,538 in gold, 802,481 ounces of silver, 1,118,680 pounds of copper, 3,459,231 pounds of lead, and 1,080,294 pounds of zinc, with a total value of \$1,950,299, in 1914. Boulder County output showed increase in all metals except silver; Clear Creek showed increase in all metals; Gilpin County showed small decrease in all metals except lead.

Mine production of metals in Colorado in 1915.

County.	Producing mines.	Ore sold or treated.	Gold.		Silver.	
			Quantity.	Value.	Quantity.	Value.
			Short tons.	Fine ounces.	Fine ounces.	
Bacon	1	1				
Boulder	113	39,778	7,760.95	\$160,433	271,292	13
Chaffee	15	68,240	15,283.56	316,146	226,996	11
Clear Creek	102	121,993	25,473.46	526,583	303,108	19
Custer	23	1,719	198.24	4,096	31,633	1
Dolores	10	14,192	577.21	11,932	127,933	6
Douglas	3		28.43			
Douglas	25	74,197	4,618.24	95,426	177,550	6
Eagle	4	1,600	32.61	5,309	3,112	
Fremont	1	123	258.52	562,878	125,665	
Garfield	90	54,052	27,229.72	153	3	
Gilpin	1		7.40	60,197	24,892	
Grand	15	6,446	2,012.03	737	9,621	
Gunnison	11	488	35.65	2,246,152	2,571,002	1,3
Hinsdale	101	481,620	108,657.60	71,530	48,369	
Lake	25	2,952	3,460.26	33,039	291,807	1
La Plata	9	28,071	1,598.26	2,613		
Mineral	4		128.40	494	103	
Moffat	1		23.90	1,277	1,073	
Montezuma	1	14	61.78	1,118,016	576,621	
Montrose	6	169	54,094.02	159,339	9,227	
Ouray	38	103,258	7,708.02	14,968	448,915	
Park	17	2,820	1.40	371		
Pitkin	13	108,579	724.08	5,273	11,266	
Rio Grande	3	1,500	17.95	583,681	430,637	
Routt	2		255.08	2,069,362	1,096,641	
Saguache	10	692	28,235.57	680,144	61,223	
San Juan	42	147,878	483,954	13,693.494	87,767	
San Miguel	25	483,954	100,105.39			
Summit	41	44,602	32,901.07			
Teller	70	948,082	661,939.02			
Total, 1915	821	2,737,020	1,084,322.92	22,414,944	7,027,972	3.
Total, 1914	866	2,677,526	961,845.20	19,883,105	8,796,065	4.
Increase or decrease	-45	+59,494	+122,477.72	+2,531,839	-1,768,093	-1.

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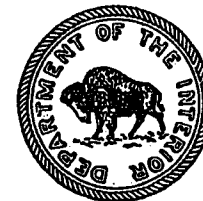
DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

MINERAL RESOURCES
OF THE
UNITED STATES
1916

H. D. McCASKEY
Geologist in Charge, Division of Mineral Resources

PART I—METALS
H. D. McCASKEY, Geologist in Charge



WASHINGTON
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1919

RIC000001050

ounces of silver, valued at \$24,327; 44,004 pounds of copper, valued at \$10,825; 123,536 pounds of lead, valued at \$8,524; and 10,970 pounds of zinc, valued at \$1,470; a total value of \$51,455, as compared with \$30,340 in 1915. There were increases in all the metals except zinc. With the exception of a nominal quantity of gold-silver bullion from the Bassick mine, all the production from this county was contained in ores shipped direct to smelters.

An appreciable quantity of gold-silver ore was shipped from the dump of the Bassick mine, in the Rosita Hill district. The Terrible¹ mine was idle. A small shipment of lead ore was made from the Marion mine, at Fairview. Producing mines at West Cliff were the Bismuth, Herman, Lady Franklin, Last Quarter, Passiflora, Pioneer, and Ten To One.

DOLORES COUNTY.

Mine production in Dolores County, Colo., in 1915 and 1916.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
		<i>Short tons.</i>		<i>Fine ounces.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
1915.....	10	14,192	\$11,932	127,533	1,032,480	209,447	35,936	\$274,551
1916.....	13	6,398	7,426	77,280	419,500	538,333	182,306	226,497
Increase or decrease, 1916.....	+3	-7,794	-4,506	-50,253	-612,980	+319,886	+146,370	-48,054

Lone Cone (Dunton) district.—A small shipment of ore was made from the Emma mine.

*Pioneer (Rico) district.*²—This district in 1916 produced 6,370 tons of ore, yielding \$5,557 in gold, 71,578 ounces of silver, 419,500 pounds of copper, 587,695 pounds of lead, and 182,306 pounds of zinc, with a total value of \$220,832, as compared with \$271,454 in 1915. The larger part of the ore shipped from this district in 1916 was copper ore, which was sent to smelters in Utah and also to Durango, Colo. There was an increased quantity of lead-zinc ore shipped, and also of zinc ore. Some iron ore (for its iron content only) was shipped to Vanadium, Colo., for use in the treatment of vanadium ores.³

The Rico Wellington group was the principal producing property. The public report of this company states that the output for 1916 was 4,989 tons of copper and lead ore, with a net value of \$19.09 a ton; and 292 tons of iron sulphide ore, with a net value of \$4 a ton. The total net value from all production was \$102,202. There was 7,062 feet of development work done.

Lessees on the Rico Mining Co.'s group also shipped a considerable quantity of lead and lead-zinc sulphide ore. Lead sulphide ore was

¹ For discussion of geology see Hunter, J. F., Some cerussite deposits in Custer County, Colo.: U. S. Geol. Survey Bull. 580, pp. 25-37, 1914.

² For discussion of geology see Cross, Whitman, and Spencer, A. C., Geology of the Rico Mountains, Colo.: U. S. Geol. Survey Twenty-first Ann. Rept., pt. 2, pp. 7-105, 1900; and Ransome, F. L., The ore deposits of the Rico Mountains, Colo.: U. S. Geol. Survey Twenty-second Ann. Rept., pt. 2, pp. 229-398, 1901.

³ For discussion of treatment of vanadium ores see Moore, R. B., and Kilhill, K. L., A preliminary report on uranium and vanadium: U. S. Bur. Mines Bull. 70, p. 74, 1914.

shipped from the Lucky Boy group by the Rico Consolidated Mining Co. Other producing mines were the Argentine, Aztec, Carbon, Forest Payroll, Iron Cap, and Nora Lilly.

DOUGLAS COUNTY.

There seems to have been no placer gold recovered by sluicing in Newlins Gulch, near Parker, and other localities of Cherry Creek in Douglas County, from which for many years there has been a nominal quantity produced each year.

EAGLE COUNTY.

Mine production in Eagle County, Colo., in 1915 and 1916.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
		<i>Short tons.</i>		<i>Fine oz.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
1915.....	25	74,197	\$95,426	177,550	60,088	1,394,043	11,141,750	\$1,643,056
1916.....	32	105,149	96,036	222,126	112,610	1,517,362	28,439,052	4,185,294
Increase, 1916.....	+7	+30,952	+610	+44,576	+52,524	+123,319	+17,296,302	+2,542,238

^a Includes small placer production.

The total value of the output of Eagle County in 1915 was by far the largest since the discovery of gold at Red Cliff in 1879, but the total value was two and one-half times as great in 1916 as in 1915. The greater part of the production of Eagle County came from the Battle Mountain (Red Cliff) district, although there was a considerably increased yield of silver from the Brush Creek district, also several small lots of ore from the Edwards district and one small lot of copper ore from the Fulford district. The value of the output of zinc for 1916 was \$3,810,609, an increase of \$2,429,122. The county continued to maintain second place to Lake County in the yield of zinc.

Battle Mountain (Red Cliff)¹ district.—The Red Cliff district in 1916 produced 103,799 tons of ore, yielding \$95,378 in gold, 113,120 ounces of silver, 110,732 pounds of copper, 1,515,580 pounds of lead, and 28,438,052 pounds of zinc, the total value being \$4,112,325, as compared with \$1,630,781 in 1915. The Iron Mask mill was continuously operated on lead-zinc ore from the Iron Mask mine, with product in zinc, lead, and iron manganese concentrates. In addition, a considerable quantity of zinc carbonate ore was shipped from the Iron Mask mine and smaller quantities of zinc carbonate ore from other properties in the district. A very large quantity of zinc-lead sulphide ores was shipped from the Black Iron and Ground Hog mines to various mills and smelters. Other producing mines of importance were the Ben Butler, Foster-Combination, Mabel, Pursey Chester, Star of the West, Tip-Top, Tram, and Wyoming Valley.

¹ For discussion of geology see Means, A. H., Geology and ore deposits of Red Cliff, Colo.: Econ. Geology, vol. 10, No. 1, pp. 1-27, January, 1915; also Argall, Philip, Siderite and sulphides in Leadville ore deposits: Min. and Sci. Press, July 11, 1914, p. 62 (siderite at Red Cliff.)

DEPARTMENT OF THE INTERIOR

JOHN BARTON PAYNE, Secretary

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

MINERAL RESOURCES

OF THE

UNITED STATES

1917

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PART I—METALS

H. D. McCASKEY, Geologist in Charge



WASHINGTON

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1921

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\$19,692 in gold, 7,352 ounces of silver, 11,916 pounds of copper, 209,396 pounds of lead, and 5,304 pounds of zinc, with a total value of \$47,552, as compared with \$76,774 in 1916.

Lessees on the Lamartine mine operated the 50-ton amalgamation-concentration mill on the property. The New Era concentration mill was also operated, yielding gold-silver-lead concentrates. Lessees shipped various classes of ore from the Freeland, Toledo, and Turner mines. Concentrating and smelting ore was shipped from the Gum Tree mine. A care of ore was shipped from the Rochford tunnel mine.

CONEJOS AND RIO GRANDE COUNTIES.

*Platoro-Gilmore-Summitville district.*¹—A small shipment of lead ore was made by lessees from the Guadalupe mine, near Jasper, Rio Grande County. On this property there was built a small mill, mainly used for experimentation.

In Conejos County, only development work was done in the Platoro district.

COSTILLA COUNTY.

*Grayback district.*²—The Grayback district has been idle for several years.

CUSTER COUNTY.³

Mine production in Custer County, Colo., in 1916 and 1917.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
		<i>Short tons.</i>		<i>Fine ounces.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
1916.....	14	2,245	\$6,309	86,971	44,004	123,536	10,970	\$51,455
1917.....	14	6,881	7,006	88,687	86,216	226,303	.....	123,861
Increase or decrease, 1917.....	.....	+3,636	+757	+51,716	+44,212	+104,767	+10,970	+72,406

The principal producing mine in Custer County was the Passiflora, near Silver Cliff. Most of the ore from this mine was shipped direct to smelters, the remainder being shipped as a concentrate product from experimentation in milling the ore. Other producing mines

¹ For discussion of the geology of the district see Hillis, R. C., Ore deposits of the Summit district, Rio Grande County, Colo.: Colorado Sci. Soc. Proc., vol. 1, pp. 20-36, 1883. Raymond, R. W., Mines and mining west of the Rocky Mountains, vol. 10, p. 329, 1875. Emmons, W. H., The enrichment of sulphide ores: U. S. Geol. Survey Bull. 529, p. 226, 1913.

² For discussion of geology see Patton, Smith, Butler, and Hoskins, Geology of the Grayback mining district, Costilla County, Colo.: Colorado State Geol. Bull. for 1909, No. 2, 1910.

³ For discussion of geology see Cross, Whitman, Geology of Silver Cliff and the Rosita Hills, Colo.: U. S. Geol. Survey Seventeenth Ann. Rept., pt. 2, pp. 263-403, 1896; and Emmons, S. F., The mines of Custer County: *idem*, pp. 406-472.

were the Black Friday, Bismuth, King of the Carbonates, La. Franklin, Last Quarter, Maverick, and Quartz King.

DOLORES COUNTY.

Mine production in Dolores County, Colo., in 1916 and 1917.

Year.	Number of producing mines.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Total value.
		<i>Short tons.</i>		<i>Fine ounces.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
1916.....	13	6,398	\$7,428	77,280	419,500	588,333	182,306	\$226,497
1917.....	8	14,026	5,213	88,222	519,916	1,772,221	1,701,353	645,704
Increase or decrease, 1917.....	-5	+7,628	-2,213	+10,942	+100,416	+1,183,888	+1,519,047	+319,297

Lone Cone (Dunton) district.—The Emma mine in this district was idle.

*Pioneer (Rico) district.*¹—All the production from Dolores County in 1917 came from this district. The ores shipped were chiefly copper ore, zinc-lead ore, and lead ore, in order of quantity. The copper ores were shipped both to Durango, Colo., and to smelters in Utah. The zinc-lead ore was shipped to Coffeyville, Kans. Some iron sulphide ore (for its iron content only) was shipped to Vanadium, Colo., for use in the treatment of vanadium ores.²

The company and lessees on the Rico-Argentine property shipped large quantities of copper ore and also a considerable quantity of zinc-lead ore. The net smelter returns from ore shipped in 1917 from this property amounted to \$47,576 for company shipments and \$41,261 for lessees' shipments.³ From the Rico-Wellington property was shipped 424 tons of copper sulphide, 1,687 tons lead-silver sulphide, 1,826 tons zinc-lead sulphide, and 709 tons pyritic ore. The net value of these shipments was \$105,589. Reserves of pyrite ore carrying 45 per cent sulphur are said to be extensive.⁴ Other producing mines were the Duncan, Iron group, Lillian D., Lucky Boy, and Swansea-Newman.

DOUGLAS COUNTY.

There have been heretofore desultory attempts to recover gold by sluicing the gravels and conglomerates in Newlins Gulch, near Parker, and at other localities on Cherry Creek, in Douglas County, and nominal quantities have been recovered from time to time, but in 1917 no work was done.

¹ For discussion of geology see Cross, Whitman, and Spencer, A. C., Geology of the Rico Mountains, Colo.: U. S. Geol. Survey Twenty-first Ann. Rept., pt. 2, pp. 7-165, 1900; and Rapinone, F. L., The ore deposits of the Rico Mountains, Colo.: U. S. Geol. Survey Twenty-second Ann. Rept., pt. 2, pp. 229-308, 1901.

² For discussion of treatment of vanadium ores see Moore, R. B., and Kithell, K. L., A preliminary report on uranium and vanadium: U. S. Bur. Mines Bull. 70, p. 74, 1914.

³ See Salt Lake Min. Rev., Feb. 15, 1918, p. 39.

⁴ Min. and Sci. Press, June 1, 1918, p. 769.

DEPARTMENT OF THE INTERIOR

ALBERT B. FALL, Secretary

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

MINERAL RESOURCES

OF THE

UNITED STATES

1920

G. F. LOUGHLIN

Geologist in Charge, Division of Mineral Resources

PART I—METALS

G. F. LOUGHLIN, Geologist in Charge



WASHINGTON

GOVERNMENT PRINTING OFFICE

1922

RIC000001074

Content of lead-zinc ores sold or treated in Colorado in 1920.

County.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	Fine ounces.	Fine ounces.	Pounds.	Pounds.	Pounds.
Chaffee.....	95				13,494	43,011
Clear Creek.....	7,227	66.08	35,719		1,141,341	372,420
Dolores.....	557	1.40	280	465	88,271	229,865
Gunnison.....	1,258				399,374	502,913
Lake.....	4,648	20.20	12,729		221,200	1,477,839
Pitkin.....	1,043		6,582		246,047	617,790
San Juan.....	162,570	9,901.32	599,222	1,080,049	13,534,963	11,537,395
San Miguel.....	8,000	2,065.71	71,940	18,867	461,107	175,617
Total, 1920.....	185,438	12,144.71	726,472	1,109,381	16,105,887	15,256,850
Total, 1919.....	116,120	6,717.87	283,741	483,627	5,837,856	21,079,069

Content of zinc ores sold or treated in Colorado in 1920.

County.	Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	Fine ounces.	Fine ounces.	Pounds.	Pounds.	Pounds.
Chaffee.....	658					240,224
Eagle.....	20,176	219.87	27,010		282,538	6,653,235
Gunnison.....	2,020					1,027,778
Lake.....	42,977	283.15	65,897	40,004	1,277,381	17,276,692
Summit.....	30,401	51.89	5,930		146,060	8,268,328
Total, 1920.....	96,232	554.91	88,837	40,004	1,705,979	33,456,257
Total, 1919.....	50,547	80.40	28,583		857,754	16,141,424

Gold and silver produced at mills in Colorado, 1920.

	Ore to gold and silver mills.	Gold in bullion.	Silver in bullion.	Ore to concentrating mills.
	Short tons.	Fine ounces.	Fine ounces.	Short tons.
Boulder.....		633.24		17,555
Clear Creek.....	404		10	46,147
Eagle.....	1,471	198.27	54	20,118
Gilpin.....				2,567
Gunnison.....	6,221	674.59	156	4,516
Lake.....				5,532
Ouray.....	1,479	2,980.85	628	38,533
Park.....				998
Pitkin.....			798	91,333
Saguache.....				3,430
San Juan.....	19,214	197.31	23	180,441
San Miguel.....	145,139	20,884.28	108,813	228,351
Summit.....	4,400	236.38	113	32,584
Teller.....	448,519	197,547.88	27,712	
Total, 1920.....	626,900	223,362.80	138,307	677,113
Total, 1919.....	1,195,986	346,035.56	242,269	439,373
Average content per ton 1920.....		0.3563	0.2206	

Mine production of metals from Colorado concentrates in 1920.

County.	Concentrates.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	Fine ounces.	Fine ounces.	Pounds.	Pounds.	Pounds.
Boulder.....	439	520.68	45,883		177,019	
Clear Creek.....	3,387	1,005.37	116,664	23,942	1,511,676	372,420
Eagle.....	15,544	254.07	27,159		282,538	6,546,554
Gilpin.....	1,002	1,281.55	9,106	11,955	220,694	
Gunnison.....	603		11,711		534,543	
Lake.....	4,196	517.90	11,101		138,243	1,154,376
Ouray.....	3,334	1,228.20	338,524	28,208	919,824	
Park.....	74	1.30	5,757	1,658	42,422	
Pitkin.....	12,602		208,317		1,655,584	
Saguache.....	545	128.66	47,697	37,082	113,843	
San Juan.....	34,734	12,378.52	638,935	1,275,105	15,937,075	11,837,395
San Miguel.....	27,649	43,817.05	927,297	938,562	7,308,219	175,617
Summit.....	11,625	232.37	13,925		201,465	8,335,963
Teller.....	3,495	10,892.60	4,260			
Total, 1920.....	119,233	72,306.27	2,406,336	2,316,572	29,043,127	28,422,325
Total, 1919.....	100,775	60,258.60	2,123,721	1,626,272	19,014,621	20,704,184

GOLD, SILVER, COPPER, LEAD, AND ZINC IN COLORADO.

Class.	Concentrates.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	Fine ounces.	Fine ounces.	Pounds.	Pounds.	Pounds.
Dry gold.....	6,228	13,408.52				
Dry silver.....	13,518	1,428.10	17,199	43,377	89,790	
Dry gold and silver.....	1,018	3,352.33	104,202	29,836	1,109,288	
Copper.....	20			79,807	7,899	
Lead.....	45,330			210	1,607	
Lead-copper.....	14,552	24,674.82	371,067	1,968,249	20,671,928	
Total to copper and lead plants.....		25,958.29	372,269	2,048,056	20,682,032	
Zinc.....						28,395,505
Lead-zinc.....						26,820
Total to zinc and lead-zinc plants.....						28,422,325

- * Recovered in zinc residues.
 * Lead recovered in zinc residues and leaded zinc oxide.
 * Zinc recovered as metal and zinc in zinc oxide.

Average content of concentrates.

	Gold.	Silver.	Copper.	Lead.	Zinc.
	Fine ounces per ton.	Fine ounces per ton.	Per cent.	Per cent.	Per cent.
Dry gold.....	2.15	2.78	0.35	0.70	
Dry silver.....	.11	14.37	.11	4.10	
Dry gold and silver.....	3.29	75.45		.58	
Copper.....	1.43	10.50	4.02	.39	
Lead.....	.54	34.66	1.06	23.02	
Lead-copper.....	1.78	22.86	2.81	13.58	
Total average.....	.85	27.18	1.15	16.14	
Zinc.....	.09	5.52	.61	3.90	48.06
Lead-zinc.....	.10	41.00		7.40	40.89
Total average.....	.09	5.55	.60	3.90	46.06

* Assay of content; no deduction for loss in smelting.

Mine production of metals from Colorado crude ore shipped to smelters in 1920.

County.	Crude ore.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	Fine ounces.	Fine ounces.	Pounds.	Pounds.	Pounds.
Boulder.....	1,507	898.53	102,941	6,685	84,069	
Chaffee.....	3,900	1,514.24	39,211	28,195	398,250	283,235
Clear Creek.....	3,873	1,144.48	103,182	38,036	945,424	
Custer.....	1,500	38.60	34,256	28,033	171,562	
Dolores.....	2,752	113.68	32,167	6,804	772,588	229,865
Eagle.....	12,517	979.30	252,508	517,109		106,681
Gilpin.....	2,032	2,468.67	32,738	74,648	214,318	
Grand.....	3		856		525	
Gunnison.....	3,927	1,164.39	8,844		423,758	1,530,691
Hinsdale.....	568	297.55	21,522	2,625	80,625	
Lake.....	165,977	26,943.37	1,086,059	799,744	8,451,945	17,600,155
La Plata.....	717	533.09	10,578		937	
Mineral.....	12,597	276.22	272,322	1,120	531,537	
Ouray.....	1,682	405.76	127,053	58,673	414,769	
Park.....	4,352	6,898.52	45,263	17,016	1,043,203	
Pitkin.....	34,463		416,329		2,814,716	
Routt.....	3	2.13	100		617,790	
Saguache.....	852	116.72	46,958	51,304	38,220	
San Juan.....	2,016	328.98	107,142	88,226	663,950	
San Miguel.....	629	82.10	28,557	10,134	263,656	
Summit.....	11,344	1,002.91	87,573	350	275,997	
Teller.....	99	732.92	1,817	451	612	
Total, 1920.....	267,280	45,942.16	2,857,976	1,727,162	17,588,661	20,368,417
Total, 1919.....	284,409	45,337.98	3,384,877	1,833,935	18,056,620	16,516,309

DEPARTMENT OF THE INTERIOR

HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

MINERAL RESOURCES

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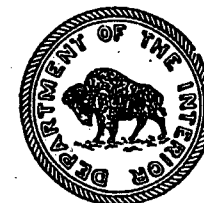
1921

G. F. LOUGHLIN

Geologist in Charge, Division of Mineral Resources

PART I—METALS

G. F. LOUGHLIN, Geologist in Charge



WASHINGTON

GOVERNMENT PRINTING OFFICE

1924

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DOLORES COUNTY.

Dunton district.—Development work on the Emma mine during October, November, and December, resulted in the shipment of a car of silver ore of good grade. Cleaning of old workings and development work at the Rosebud mine resulted in milling some silver ore, with product of a small lot of good silver concentrates.

Pioneer (Rico) district.—Very little mining was done in the Rico district, owing to low prices for lead and zinc and to litigation. Several cars of silver ore were shipped from the Rico Wellington group and the Syndicate group. In the development of the copper, lead, and lead-zinc ore bodies in this district, large deposits of barren pyrite have been blocked out, but the market for pyrite has been very limited.

DOUGLAS COUNTY.

A few ounces of placer gold were washed from gravels near Franktown.

EAGLE COUNTY.

Battle Mountain (Gilman, Red Cliff) district.—Because of the low price of zinc, the large zinc deposits of the Empire Zinc Co., at Gilman, blocked out during 1919 and 1920, may be said to have been nonproducing in 1921. However, the mine was kept in operation by the shipment of large quantities of pyrite ore, carrying silver and copper, an ore particularly suitable for fluxing purposes at the Arkansas Valley, Pueblo, and Durango lead-copper smelters in Colorado, and at the Garfield and Murray plants in Utah, where the iron ores were in demand, because of a lack of such ores and an excess of siliceous ores from Utah mines. Colorado has always had considerable copper in its gold and silver ores. Gilpin County in its early years produced considerable copper used as a carrier for gold and silver in the matte produced at the Argo smelter. This, the first successful smelter in Colorado, was operated at Black Hawk from 1868 to 1878, when it was moved to Denver and operated to 1910. Brecco Hill, Carbonate Hill, and Iron Hill mines at Leadville from time to time have shipped appreciable quantities of copper ores, and the complex ores of the San Juan region generally carry some copper; but the Battle Mountain mines of Eagle County showed indications in 1921 of being among Colorado's first copper mines. With the mining of this pyritic copper-silver ore, large quantities of zinc ore which greatly exceed the pyritic ore in quantity were mined and stored in slopes and stock piles and much had to be transported to storage at Canon City for use when the Empire Zinc Co. again reopens its large modern zinc-oxide plant, completed in 1920.

Other producing mines in the Battle Mountain district in 1921 were the Alligator, Alpine, Ground Hog, Pursey Chester, Red Cap, and Star of the West. Much drifting and diamond drilling was done at the Liberty mine on Turkey Creek, with the hope of finding zinc ore bodies.

Brush Creek district (Eagle).—Some work was done in the Brush Creek district in driving an audit to cut under the surface workings of the Lady Belle-North Dakota group, from which several hundred thousand ounces of silver were taken in 1913-1918.

Burns district.—Development work was done on several prospects in the Burns district.

Gypsum district.—Some development work was done on a steeply dipping bedded pyrite deposit with gypsum gangue, with surface outcrop of hematite and limonite, 3 miles north of Gypsum.

Mount Egle district (Edwards).—Some development work was done in this district.

EL PASO COUNTY.

At Colorado Springs the Golden Cycle 1,200-ton roast cyanide mill was operated steadily, but not at capacity, chiefly on ores from the Cripple Creek district, but also on small lots of ore from Boulder County. The Cresson mine, in the Cripple Creek district, continued to contribute a large quantity of the ore going to the Golden Cycle mill, but the Portland Co. during part of the year sent much of its better grade ores to its own Independence mill, at Victor, as well as all its low-grade mine and dump material.

FREMONT COUNTY.

The Empire Zinc Co.'s magnetic separation plant and new zinc-oxide plant, and the Ohio zinc-oxide plant, all at Canon City, were idle in 1921, as was the River Smelting & Refining Co.'s matting and fuming plant, at Florence.

No production was made from the prospects in the Badger Creek, Cotopaxi, and Parkdale districts.

GILPIN COUNTY.

Southern districts (Black Hawk, Central City, Nevadaville, Russell Gulch).—The amalgamation-concentration mills in the southern districts were not operated for any length of time in 1921. The U. P. R. (Buell) mill, overhauled in 1920, was operated for a month or two, the Polar Star mill was operated intermittently, and the Iron City mill was operated for several months. Some Gilpin County milling ores were hauled to Idaho Springs for treatment.

Within the limits of the town of Central City, the East Boston-Rialto yielded several hundred tons of ore.

In the Enterprise district, below Black Hawk, small lots of ore were shipped from the Black Jack, Button, Champion, Mascot, and Wheeler.

In the Hughesville-Hawkeye district, north of Black Hawk, the Midwest Co. unwatered the Cyclops mine, retimbered the shaft 760 feet and sunk an additional 25 feet, did 1,100 feet of drifting and stoping, completed a new 100-ton gravity-concentration and oil-flotation mill, and in the course of development shipped several hundred tons of silver ore to the Iron City concentration mill.

In the area embracing Gunnell Hill and Eureka and Prosser Gulch, the lateral from the Argo tunnel to the bottom of the concrete shaft was cleaned and retimbered and driven 50 feet westerly. A car of lead-silver ore was shipped from the Rara Avis mine.

Production in the area embracing the town of Black Hawk, and Gregory, Bobtail, and Bates hills was confined to small lots from the

DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

MINERAL RESOURCES
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G. F. LOUGHLIN
Geologist in Charge, Division of Mineral Resources

PART I—METALS
G. F. LOUGHLIN, Geologist in Charge



WASHINGTON
GOVERNMENT PRINTING OFFICE
1925

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Boulder County made a small increase in production. Clear Creek and Gilpin counties both showed appreciable increases.

Mine production of gold, silver, copper, lead, and zinc in Colorado in 1922.

County.	Producing mines.	Ore sold or treated (short tons).	Gold. ^a		Silver. ^a	
			Fine ounces.	Value.	Fine ounces.	Value.
Adams.....	1		24.09	\$498	4	\$4
Boulder.....	60	3,415	1,791.66	37,037	121,073	121,073
Chaffee.....	8	6,844	964.40	19,936	26,187	26,187
Clear Creek.....	54	69,425	1,751.13	36,199	196,207	196,207
Custer.....	4	17,212	8.08	167	14,520	14,520
Dolores.....	5	678	94.48	1,953	30,267	30,267
Douglas.....	1		.58	12		
Eagle.....	7	71,892	3,488.37	72,111	583,737	583,737
Fremont.....	1	7	1.02	21	174	174
Gilpin.....	43	13,707	2,501.96	51,720	43,910	43,910
Gunnison.....	9	221	444.08	9,180	3,803	3,803
Hinsdale.....	10	1,550	62.79	1,298	50,074	50,074
Lake.....	54	112,547	19,981.68	413,058	952,048	952,048
La Plata.....	16	791	1,560.63	32,261	10,656	10,656
Mineral.....	9	3,978	80.01	1,654	106,903	106,903
Moffat.....	2		5.51	114		
Montrose.....	2	251	15.58	322	17,968	17,968
Ouray.....	18	123,066	6,093.32	125,960	1,226,670	1,226,670
Park.....	11	1,120	6,875.07	142,120	15,528	15,528
Pitkin.....	16	119,023			525,169	525,169
Roitt.....	1				82	82
Saguache.....	4	9,671	234.57	4,849	63,542	63,542
San Juan.....	26	8,808	1,246.09	25,759	77,864	77,864
San Miguel.....	26	397,840	52,140.80	1,077,846	1,645,459	1,645,459
Summit.....	37	17,894	13,630.22	281,762	119,604	119,604
Teller.....	55	432,129	195,318.03	4,037,582	24,462	24,462
Total, 1921.....	480	1,412,100	308,314.15	6,373,419	5,855,911	5,855,911
	382	1,281,381	330,658.99	6,835,328	5,631,657	5,631,657
Increase or decrease, 1922.....	+98	+130,719	-22,344.84	-461,909	+224,254	+224,254

County.	Copper.		Lead.		Zinc.		Total value.
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
Adams.....			68,470	\$3,768			\$502
Boulder.....			661,725	36,395	178,000	\$10,146	161,876
Chaffee.....	20,526	\$2,771	1,042,491	57,337	800,000	45,600	95,435
Clear Creek.....	7,874	1,053	660,618	36,334			326,406
Custer.....	32,141	4,339	87,200	4,796			55,360
Dolores.....	24,069	3,252					40,268
Douglas.....			322,818	17,755	11,000,000	627,000	12
Eagle.....	1,330,296	179,590	4,273	235			1,480,193
Fremont.....	348	47	246,945	13,582			477
Gilpin.....	24,860	3,356	13,382	736			112,568
Gunnison.....	526	71	114,200	6,281			13,790
Hinsdale.....	14,269	1,926	303,700	9,003,000	613,171		59,579
Lake.....	871,370	117,635					2,209,612
La Plata.....			153,455	8,440			42,917
Mineral.....	3,422	462					117,459
Moffat.....							114
Montrose.....	61,119	8,251	1,484,526	81,649			26,541
Ouray.....	58,149	7,850	155,982	8,579			1,442,129
Park.....	4,215	569	3,535,309	195,542			166,796
Pitkin.....							720,711
Roitt.....							82
Saguache.....	41,622	5,619	111,782	6,148			80,158
San Juan.....	110,348	14,897	1,651,982	90,859	1,300,000	74,100	283,479
San Miguel.....	673,867	90,972	7,060,891	388,349			3,202,626
Summit.....	94,413	12,746	559,330	30,763	977,000	55,689	500,564
Teller.....							4,062,044
Total, 1921.....	3,373,454	455,416	23,477,200	1,291,246	23,258,000	1,325,706	15,301,698
	4,153,442	535,794	19,660,466	884,721	2,360,000	118,000	14,005,500
Increase or decrease, 1922.....	-779,988	-80,378	+3,816,734	+406,525	+20,898,000	+1,207,706	+1,296,198

^a Includes placer production.

REVIEW BY COUNTIES.¹

ADAMS COUNTY.

A reminder and corroboration of the existence of the intermittent gravel bars carrying sufficient gold to lead the pioneer of 1858 from Denver to Golden along the bed of Clear Creek is seen in the recovery of placer gold in 1922 by a highway contractor in a washing and sluicing apparatus attached to his gravel-screening mill on the gravel bar in Clear Creek near the point where the creek crosses the Denver-Boulder-Longmont highway that goes by way of Federal Boulevard. The bullion recovered averaged 0.858 in fineness of gold and 0.136 in fineness of silver.

BOULDER COUNTY.

Central district.—The Central district, near Jamestown, produced 122 tons of ore carrying \$2,803 in gold, 335 ounces of silver, and 379 pounds of lead, having a total value of \$3,159, as compared with \$4,644 in 1921. The production was the result of intermittent operations by lessees, who shipped small lots from seven properties. The largest shipments consisted of gold ore from the Earl-Niagara and Wano mines to the Golden Cycle mill, at Colorado Springs, part of which was shipped direct and part through the Boulder sampler.

Gold Hill district.—The Gold Hill district produced 311 tons of ore, which carried \$8,479 in gold, 5,517 ounces of silver, and 3,733 pounds of lead, having a total value of \$14,201, as compared with \$12,850 in 1921. Of the 18 producing properties the principal mines were the Emancipation, Myrtle, and Scotia, from which gold ore was shipped to the Golden Cycle mill; the Goldsmith Maid and Tippecanoe, from which siliceous silver ore and lead-silver ore were shipped to the Leadville smelter direct and through the Boulder sampler; and the Nil Desperandum and Slide, from which gold ore was shipped to Leadville through the sampler.

Grand Island district (Cardinal, Caribou, Eldora, and Nederland).—The Grand Island district produced 313 tons of ore, carrying \$1,914 in gold, 45,580 ounces of silver, and 17,431 pounds of lead, having a total value of \$48,453, as compared with \$46,058 in 1921. The Caribou mine, on which several sets of lessees worked continuously throughout the year and shipped high-grade silver ore in small lots, produced the bulk of the output of the district. Other producing mines were the Boulder County, Congo Chief, Grant County, Poorman, and Potosi, all shipping small lots of high-grade silver smelting ore.

Magnolia district.—Several small lots of ore from the Magnolia district, aggregating 28 tons, carrying \$2,383 in gold and 42 ounces of silver, were purchased by the Boulder sampler.

Sugar Loaf district.—The Sugar Loaf continued to be the chief producing district in Boulder County, 16 mines making an output of 1,664 tons of ore, carrying \$20,184 in gold, 62,192 ounces of silver, and 11,709 pounds of lead, with a total value of \$83,020, as compared with \$73,820 in 1921. Several sets of lessees on the Yellow Pine

¹ For production by counties see table, p. 530.

DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

MINERAL RESOURCES OF THE UNITED STATES

1923

F. J. KATZ
Geologist in Charge, Division of Mineral Resources

PART I—METALS



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CLEAR CREEK COUNTY

Alice district (Yankee, Lincoln).—Several tons of gold ore from the Champion property was treated in the Reynolds stamp amalgamation mill.

Argentine district.—Development work for many years resulted in 1923 in what promises to be a new mine in the Argentine district. The Gold Belt tunnel, driven into Mount McClellan from Clear Creek, 3 miles above Silver Plume, opened a vein of silver-lead and silver-lead-zinc ore, from which several hundred tons of relatively rich silver ore was shipped to the Idaho Springs sampler and direct to the Leadville smelter, and several hundred tons of lead-zinc-silver ore to the Watrous concentrating mill at Silver Plume. The products of milling were lead concentrate, dry silver concentrate, and zinc concentrate. A car of copper-gold-silver ore was shipped from the Santiago mine.

Empire district.—Several narrow-gage cars of gold-silver ore from the Empress Tunnel property was concentrated at Idaho Springs. A car of sulphide gold ore was shipped to the A. V. smelter, Leadville, from the Silver Mountain mine.

Griffith district (Georgetown, Silver Plume).—Eleven mines in the Georgetown-Silver Plume district produced 17,446 tons of ore, yielding \$5,093 in gold, 68,923 ounces of silver, 6,061 pounds of copper, 659,743 pounds of lead, and 539,700 pounds of zinc, with a total value of \$145,383, as compared with \$209,169 in 1922. The East Butte Copper Co. continued for part of the year the milling started in 1922 of the dumps of the Diamond, Pelican, and Zero adits. The product was a lead concentrate carrying a relatively high content of silver. The Silver Plume Silver Mines Co. completed its 75-ton gravity-concentration and oil-flotation mill across Clear Creek from the Terrible mill and an aerial tram to the Mammoth mine dump, from which several hundred tons was sorted and milled with a product of zinc-silver and lead-silver concentrates. The Mendota mill was operated on lead-zinc-silver ore from the Mendota-Frostburg mine, producing lead-silver and zinc-silver concentrate. The Sunburst mill was operated for a time on dry silver ores from the Sceptre-Sunburst group. The St. George mine and gravity-concentration and oil-flotation mill were operated for a time. The Capital gravity-concentration and oil-flotation mill was operated for a short time. Several cars of lead-silver smelting ore were shipped from the Backbone mine.

Idaho Springs district.—In the Idaho Springs district 26 mines produced 2,535 tons of ore, carrying \$15,239 in gold, 14,422 ounces of silver, 5,021 pounds of copper, and 162,314 pounds of lead, with a total value of \$39,165, as compared with \$92,049 in 1922. The year was probably the quietest Idaho Springs has ever experienced. The Gem mines and mill, which have usually supplied the bulk of the production, were operated for a short time only. The Hudson amalgamation and concentration mill was operated for a time. Small lots of ore were mined from the Almaden, Argo (Ute Creek), Edgar, Crown Point, Gem, Golden Edge, Lincoln, Little Mattie, Queen Elizabeth, Tesoro Vault, and Tropic.

Montana district (Lawson, Dumont).—The Montana district from 7 mines produced 764 tons of ore, yielding \$2,702 in gold, 20,745 ounces of silver, 5,558 pounds of copper, and 72,272 pounds of lead,

with a total value of \$25,589. Small lots of milling and smelting ore were shipped from the Albion, Bellevue-Hudson, Big Chance, Jo Reynolds, Mattie Jack, Millington, and Tabor tunnel.

Trail Creek district (Lamartine, Freeland).—The Trail Creek district produced 1,244 tons of ore, yielding \$5,916 in gold, 2,029 ounces of silver, 11,041 pounds of copper, and 35,900 pounds of lead, with a total value of \$11,716, as compared with \$3,648 in 1922. The principal producing mine was the Freeland, from which both smelting ore and milling ore were mined.

CONEJOS COUNTY

Because of the inaccessibility of the ore deposits of Conejos County, nothing but assessment work has been done on them for many years. There are said to be some large bodies of low-grade gold ore in the county.

COSTILLA COUNTY

No work of any kind was done in the mining districts of Costilla County. In the Grayback district, north of Russell, there are some gold placer areas and undeveloped bodies of low-grade gold ore. In the El Plomo district, on Rio Seco, northeast of San Luis, there is said to be a large low-grade gold deposit in quartzite, suitable for quarrying.

CUSTER COUNTY

Smelting ores, valuable chiefly for their silver content but also carrying lead and copper, were shipped from the Lady Franklin, Maxine Elliot, Passiflora, and Ten-to-One properties, near Westcliffe. One car of lead-silver ore was shipped from the Little Annie claim, near Rosita. The Alaska Mining & Milling Co. continued the remodeling of the Bassick cyanidation plant, brought the electric power line from Ilse, 8 miles distant, and operated the mill for a time on material from the Bassick dump. The cyanide bullion contained 13.2 parts of silver by weight to 1 of gold. The jig and table concentrating mill at the Terrible mine, at Ilse, with a capacity of 200 tons in 24 hours, was operated practically full time the entire year. This mill treats a low-grade cerusite ore, making a product of 70 per cent lead concentrate.

DOLORES COUNTY

Dunton district.—A car of silver smelting ore of relatively high content was shipped from the Emma mine.

Pioneer district (Rico).—A car of lead-zinc ore was shipped to Blendo, Colo., from the Bancroft mine. A small lot of silver-copper ore was shipped to the Durango smelter from the F. V. G. mine. The Rico Wellington Mining Co. reported the opening of 800 feet of drifts, crosscuts, and raises at the General Sheridan mine and shipments of

¹For geology and description of mines at Platoro, Gilmore, and Stanner, see Patton, H. B., *Geology and ore deposits of the Platoro-Summitville mining district, Colo.*: Colorado Geol. Survey Bull. 13, 1917. See also Rio Grande County.
²For description of geology, see Patton, H. B., and others, *Geology of the Grayback mining district, Costilla County, Colo.*: Colorado Geol. Survey Bull. 2, 1909; also Van Dine, E. O., and P. H., *Notes on the geology of the Sangre de Cristo Range*: Colorado Sci. Soc. Proc., vol. 5, pp. 76-89, 1894.

500 tons of lead-silver ore to the Durango smelter. Several hundred tons of silver-copper ore and nearly 200 tons of zinc-lead ore were shipped from the Falcon group. A car of lead-silver and several cars of zinc-lead ore were shipped from the Syndicate mine. Several cars of lead-silver ore were shipped from the Yellow Jacket mine.

EAGLE COUNTY

Battle Mountain district (Red Cliff, Gilman).—A very large quantity of pyrite ore, carrying a relatively low content of silver, some copper, lead, and gold, was shipped from the Eagle mines of the Empire Zinc Co. to the Garfield and Murray smelters, in Utah. In addition, a large quantity of zinc-iron-lead sulphide ore from these mines was moved to Canon City, Colo., for concentration by magnetic separation into high-grade zinc concentrate for roasting to zinc oxide, a low-grade zinc concentrate, and a pyritic lead-silver-gold concentrate. Other producing mines were the Ben Butler, Foster Combination, Ground Hog, Pursey Chester, Silurian, Sulphide Lease, and others. Several cars of iron-manganese ore were shipped to the Colorado Fuel & Iron Co., at Pueblo, from the J. Best claim.

Brush Creek district (Eagle).—Very little work was done in 1923 in driving the adit to cut the Lady Belle-North Dakota group at depth.

EL PASO COUNTY

At Colorado Springs the Golden Cycle 1,200-ton roast-amalgamation and cyanidation mill was operated steadily but not at full capacity, chiefly on the gold ores from the Cripple Creek district and small lots of gold ore from Boulder County. The Cresson mine, in the Cripple Creek district, continued to contribute about half of the ore treated at the Golden Cycle mill.

FREMONT COUNTY

At Canon City the Empire Zinc Co.'s magnetic separation plant was steadily operated on zinc-iron sulphide ore from its Eagle mines at Gilman, Eagle County, and its zinc oxide plant was operated on concentrates from the magnetic separating mill, concentrates from Hanover, N. Mex., and some zinc carbonate ore from Leadville. At Florence the River Smelting & Refining Co.'s matting and fuming plant was operated until November 1. A car of zinc concentrates from previous milling operations at the Cotopaxi mine, at Cotopaxi, was shipped in 1923.

GILPIN COUNTY

Southern districts (Black Hawk, Central City, Nevadaville, Russell Gulch).—The Polar Star custom amalgamation mill, at Black Hawk, was operated intermittently. The Midwest mill was operated only a short time and only on company ores. Some Gilpin County milling ores were hauled to Idaho Springs for treatment.

No ore was shipped from mines within the town limits of Central City.

In the Enterprise district, below Black Hawk, dry gold ore was shipped to the smelter, and milling gold ore was amalgamated and

concentrated from the Waine group. Silver and lead-silver ore was shipped to smelters from the Champion, Black Jack, and Wheeler.

In the area embracing Gunnell Hill and Eureka and Prosser gulches several cars of lead-silver-gold ore were shipped direct to the Leadville smelter, and milling gold ore from the Rara Avis mine was concentrated into lead-gold-silver concentrate.

In the area embracing the town of Black Hawk and Gregory, Bobtail, and Bates hills 165 tons of gold ore from the Dump lode was treated in a new 10-stamp amalgamation mill on the property, and operations were then abandoned. Other producing mines were the Etna, Mary Miller, Lucky No. 2, Thanksgiving, and Senator.

In the Hughesville-Hawkeye district, north of Black Hawk, the Midwest 100-ton gravity-concentration and oil-flotation mill was operated for a short time on low-grade silver ore from the Cyclops group. Several hundred tons of lead-silver ore was mined from the Atlantic prospect, and several cars of lead-silver ore from the Coyle prospect.

In the Nevada district 100 tons of gold ore from the Columbia tunnel (Argo claim of Kansas Burroughs group) was treated by amalgamation and concentration, and two cars of gold ore were shipped to the A. V. smelter. Mining from the Newhouse (Argo) adit level at the Ophir-Burroughs mine was abandoned in January, 1923.

In the Quartz Valley district several lots of milling ore were mined from the Greenside, Spur Daisy, and Margaret Glennon.

In the Russell Gulch district several cars of smelting silver ore were shipped from the Druid mine; milling gold ore was mined from the Fairfield-Morning Star group; both milling and smelting gold ores were mined from the Jupiter-St. Clair group; milling gold ore from the Davis; and smelting gold ore from the Saratoga and Two Forty.

Northern district.—In the Silver Creek district, near Apex, the amalgamation-concentration mill on the Reform Lode group was operated for six months.

Near Rollinsville the Colorado-Penobscot group produced gold ore, which was milled in a concentrating mill on the property. The Smuggler amalgamation mill was operated for a time.

GRAND COUNTY

A 2-ton lot of relatively high-grade silver-lead ore was shipped from the Ready Cash mine, in the La Plata district.

GUNNISON COUNTY

Domingo district.—The Good Hope mine was unwatered to the 600-foot level during the year.

Goose Creek district (Madera).—Several hundred tons of arsenic ore was shipped from the Goose Creek district to the Globe plant, Denver. No settlement was made for the silver in this ore.

Gold Brick district (Ohio City).—At the Carter mine 700 feet of drifts and 100 feet of raises were opened, and 3,300 tons of gold ore was milled in the company's 20-stamp amalgamation-concentration mill.

Quartz Creek district (Pitkin).—A car of silver ore was shipped to the A. V. smelter, Leadville, from the Maid of Athens group.